VERNON LYMAN KELLOGG

products of nature's fiber producers, and those which he himself squeezes through a spinnaret.

The machines which attempt to duplicate the combining of fibers into yarn by the skilful fingers of the hand spinner whose art has passed down to him through generations from his cave-man ancestors have been with us for years. Here, too, modern science is making a critical survey of the correctness of the long-used principle of drafting. The cotton lap entering the carding machine as a sheet of matted fiber some 42 inches wide by less than one-half inch thick is drawn out in length more than 30,000,000 times to form a yarn. The problem of insuring that each successive cross section of such a yarn will contain the same number of fibers as every other is almost insoluble by such means. Science must lead the way to better yarn structure.

The familiar loom for weaving fabric uses the fundamental motions of carrying successive filling yarns through sheds formed by the separation of the warp ends, even as the earliest of American weavers, thousands of years ago, carried out the process on his bar loom. The modern loom is a marvelous combination of automatic mechanisms. All these have been added to those first built into a power loom by Cartwright (1743–1823) before he had ever seen even a hand loom. Again science must simplify and improve the fabrication of yarn into fabric.

The ancients used their madder, indigo and Tyrian purple to produce colored fabrics which would not fade. A major problem still facing the textile industry is to produce synthetic dyes which will be fast to use, washing and light. Why certain atoms (carbon, nitrogen, hydrogen and oxygen) which, in one combination, produce the indigo used to dye the silk filament, itself produced by another arrangement of the same atoms, is still to be discovered. This problem should interest all of us, for after all we are all dressed fundamentally in an impalpable powder combined with the essential element of laughing gas, a whiff of the lightest gas we know, plus a fraction of the breath of life. Such are textiles. Such are some of the problems—new and old—of the textile technologist.

the basin's drainage stream comes down. I have no doubt this was often done by sheepmen. But it is a dreadfully roundabout, difficult, long way. Moreover, the trail that leads down into Paradise Valley is almost impassable now, and by the time the sheepmen have ceased for a year or two to use it, it will practically cease to exist. Trails of this sort have never been monumented, and a few seasons will see them overgrown, washed out — in fact, lost. This is a matter the Sierra Club should promptly and effectively interest itself in. Next season should be entirely devoted to *trail-marking*.

All the altitudes herewith reported are simply my estimate. Mt. Rixford, however, must be excepted. I found Dr. Rixford's record on that, and the height was therein given as 13,500 feet.

May 1900

KING'S RIVER CAÑON TRAIL NOTES.

By Vernon L. Kellogg.

The Grand Cañon of the South Fork of the King's River will certainly be visited by increasing numbers of mountain-lovers. From a headquarters camp in the cañon the peaks of the King's-Kern Divide (Junction, Stanford, Crag Ericsson, No. 4, Brewer), the great triumvirate, Williamson, Barnard, and Tyndall, in the Main Crest just south of the Divide, the peaks of the Main Crest from Junction north to the Palisades (Keith, Bradley, University of California, Kearsarge, etc.), Mts. Gardner and King, Bolton Basin, and all the interesting mountains and gorges whose waters flow into Paradise Cañon and Bubb's Creek, are readily accessible. With the new trail, much shorter than the old, now being made by Forest Ranger Kanawyer from Millwood to the cañon, the region is made more easily, at least more quickly, accessible from the outside than it has been heretofore. Mr. Kanawyer will also keep provisions and camp supplies for sale in the cañon. With this probable increased visitation of the cañon in mind, I have written out the following brief account of the course, character, and lengths of some of the trails of this region. The notes may help the new-comer in planning his excursions.

First, as to getting in to the cañon itself. One goes by rail to Fresno or Sanger, by stage a long day (or better, a night, to escape the heat of the valley and foothills: Gallagher and Deneen, address Sanger, will take you, if you are a "stageful," through by night) to Millwood, or, when the new trail is completed, to Long Meadow, and thence

by pack-train into the cañon. The old trail has been described several times in the BULLETIN. The distances between camping-places and special landmarks on it are given (in hours) exactly by Mr. Lincoln Hutchinson in the BULLETIN (Vol. II., p. 111). To traverse this trail from Millwood to your definitive camp in the cañon requires, for the ordinary party, two days and a half (two nights' camping on the trail). Coming out from the cañon the trip is made in two days (one night's camping on the trail). By the new trail it is expected that a party can leave the cabin "hotel" at Long Meadow rather early in the morning, lunch in Big Bowlder Cañon, and reach the King's River Cañon by night of the same day. The King's River will be reached, however, several miles lower down than now reached by the old trail, and it will require the following forenoon to get up to a place in the cañon desirable for headquarters camp. The new trail keeps much closer to the King's River than the old; gives, in fact, intermittent views of the river and cañon all the way in. It ought to be an exceedingly picturesque way.

The cañon can, of course, be reached from other points. From Visalia, for example, one follows a wagon road to Big Meadows, and thence by a trail to Horse-Corral Meadows, where the old Millwood trail is joined.

Once in the Grand Cañon, the best place for a headquarters camp is on the north side of the river somewhere near the mouth of Copper Creek. Mr. J. N. Le Conte camps near the mouth of Granite Creek, a mile down the river from Copper Creek. Professor Brown camps near the confluence of Paradise Cañon and Bubb's Creek, a mile or more above the mouth of Copper Creek. There is feed for animals between the mouths of Copper and Granite creeks, and also at the confluence of Paradise and Bubb's.

In giving the lengths of the trails in the neighboring region, I shall take the mouth of Copper Creek as a point

of departure. For a guide to the region Mr. Le Conte's sketch-map of Bubb's Creek Basin published in the BULLETIN (Vol. II., No. 2), is the best you can get. As all the important topographical features of the region and the courses of the trails are plainly shown on this map, I shall only undertake in the following notes to give the lengths or distances in terms of time and a few statements as to the character and condition (difficulty or ease, availability or non-availability for animals, etc.) of the trails. It is needless to say that a trail's length, in time, varies with the tramper and climber. The times given are ordinary times.

Copper Creek to Fox's Bridge.— An easy trail, or rather two easy level trails, one on each side of the river, perfectly distinct, following down the river past the mouth of Roaring River (to visit Roaring River Falls take the trail on south bank). Animals. To get to south bank of river, cross on log-jam between mouths of Copper and Granite creeks, or cross on foot-log a little above mouth of Granite Creek. Ford a little above foot-log. Two hours; to Roaring River Falls, one and a quarter hours.

Copper Creek to beginning of Paradise Cañon.—Easy level trail up the river on north bank. Animals. Forty minutes. To beautiful falls in Paradise Cañon follow distinct trail up west bank of Paradise. Animals. Short distance. [Met grizzly once near falls!]

Copper Creek to top of Grand Sentinel.— Down King's River to foot-log; cross to south bank; up (east) south bank a few rods to fence, where find dim trail to south through bushes (trail necessary here) into Avalanche Cañon. Then up Avalanche; steep, faint trail; keep mostly to bed of stream or near it (at first no water, later too much); (trail not so necessary); leave cañon to left just beyond large smooth rock-face by single conspicuous weather-beaten

tree (two or three hours from beginning of trail); follow up gully, steep, no trail, no water, or but trace, gully fading out to summit 3,480 feet above floor of cañon; the whole ascent three to four hours; steep and tiring, but not otherwise difficult; not dangerous; guard against loose stones in Avalanche Cañon, also loose rattlesnakes! No water to drink (carry canteen) after leaving Avalanche Cañon. View of the Grand Cañon and Bubb's Creek the best obtainable; good view of Mt. Brewer and University of California Peak.

Copper Creek to Goat Mountain.— Goat Mountain is a good "first mountain" to climb from the cañon. It is an excellent point of orientation, standing as it does out of the Main Crest, and high enough to include a fine sketch of it in its panorama. Trail is the regular Granite Basin trail, running north from mouth of Copper Creek on west side of Copper Creek for about two hours; steep at first; crosses Copper Creek at spring (Wood's sheep corral); follow till small flattish cairn of eight or nine stones on larger rock is reached; here take the right branch of trail, rather faint, till convenient crossing-place (first group of pine trees on bank of stream) on stream to the right is found; cross to right (from now on no regular trail, occasional sheep-paths); zigzag up steep, scrub-covered hillside; work down, keeping rather to left, to dry gully, cross and up to summit of little ridge; keep north along center of this ridge until at very foot of the shoulder of Goat Mountain (the mountain directly in front to north), and work to right among stones over ridge, and camp (near timber-line) in low pines near little streamlet; small ponds just above, and large meadow for animals some distance below. This spot is about four hours from mouth of Copper Creek. Fine view from this camp of Paradise Cañon region, Mts. Gardner, King, and Brewer. Summit of Goat Mountain 12,500 feet; can be

easily reached in two hours or less. From Goat Mountain camp to mouth of Copper Creek about two and a half hours. The whole trip can be made in one day, but hard; better take a day and a half. Trail all easy, a little troublesome picking out way after leaving trail. Animals may be readily taken to timber-line camp. Ascent of summit from timber-line camp perfectly easy. (See bearings of peaks in panorama at end of article.)

Copper Creek to Lake Charlotte and Bullfrog Lake.— Regular trail from cañon over Kearsarge Pass to Independence. Animals. From mouth of Copper Creek follow up north bank King's River to ford and log jam across Paradise Creek (forty minutes); cross, turn to right and climb steep but short hill into Bubb's Creek Cañon; follow up Bubb's Creek on north bank, reach mouth of Rhoda Creek (about three and a half hours); here either turn to left, keep along west bank of Rhoda Creek, climbing steeply, then following up Rhoda Creek on north bank to Lake Charlotte, and on to Lower Bullfrog Lake; or cross Rhoda Creek near mouth, keep up Bubb's Creek (north bank) to where trail turning to left climbs steeply up to Lower Bullfrog Lake. By either trail it is a day's journey from mouth of Copper to Lower Bullfrog. Trail all fair, and always distinct, good grazing for animals; sometimes rather closely eaten. Make this headquarters camp for climbing University of California Peak, Mt. Rixford, etc.

Bullfrog Lake to Kearsarge Pass.— Plain, easy, well-worn trail (animals) on north bank east to Pass. About one hour. From Pass easy climb to summit of Mt. Gould (13,391 feet), one hour and a half. Mt. Gould is the first point or peak in the Crest north of the Pass.

Bullfrog Lake to University of California Peak.— No trail. Set out directly toward peak, following string of lakes

which leads into northwest basin of peak; Kearsarge Pinnacles, sharp, ragged ridge, on right. Climb this ridge to right about even with last lake in basin, coming out on western slope of mountain; work up, keeping to right (south and east), and make last climb over rough rocks on south face, in fact a little east of south. Last stretch a little difficult. Time from Bullfrog Lake about three and a half hours. Panorama fine; the tremendous sheer drop into Owen's Valley impressive; best point to view the great valley stretching north and southeast of Main Crest and the mountains far to east.

Bullfrog Lake to Mt. Rixford.— No trail. Begin climbing immediately to north of the lake; into basin (Rixford Bowl); to right (east) to ridge, and along ridge (north) to summit (13,300 feet?); about two hours. Fine view of Bolton Basin immediately below to north; also of head of South Fork. Fine view of Main Crest from Palisades south to Junction Peak. Mt. Whitney also visible. In descending take slide of loose stuff at left (east) of first saddle under the summit into the gorge of Colored Peak (next peak to east), and follow streamlet. Descent less than one hour. Good sport! Mt. Rixford is indicated on Le Conte's map (BULLETIN, Vol. II, No. 2,) as unnamed mountain immediately to west of Colored Peak. (See bearings of points in panorama at end of article.)

Copper Creek to East Lake.— Follow Bubb's Creek trail as described in "*Copper Creek to Bullfrog Lake*" to mouth of South Fork of Bubb's Creek. Here find branch to right, cross Bubb's Creek, ford and fallen logs just below, and follow up South Fork on west bank; trail plain for a while, but rather hard to follow after getting on rocks; many little cairns (too many, trail too diffuse); trail keeps rather away from stream bank; distance from mouth of South Fork to East Lake, one and a half to two hours; lose time on

account of diffuse trail; trail some places rather uneven for animals, though not really bad. From Copper Creek to East Lake an easy day's journey, with long lunch stop and early night camp. Camp on west side of East Lake near mouth of Ouzel Creek. (See President Jordan's sketch map of East Lake region in BULLETIN, Vol. III., No. 1.) Fine grazing for animals on shore of lake. Make this headquarters camp for climbing Mt. Brewer and Stanford University Peak.

Bullfrog Lake to East Lake.— After "doing" Kearsarge Pass region, one can begin exploring the Brewer-Stanford region without returning to headquarters camp in the cañon, by going from Bullfrog Lake down into Bubb's Creek, follow down it (west) to mouth of South Fork and up (south) South Fork to East Lake. Time, three and a half to four hours.

East Lake to Mt. Brewer.— From camp at mouth of Ouzel Creek take smooth rock (no trail) between Ouzel Creek and Barbara Brook, and make for ridge projecting east from main peak of Brewer (central one of the three peaks visible looking west as you begin the climb). Get on the ridge and follow to summit (13,886 feet); easy ascent. Time three hours or less from East Lake camp. (See trail marked on Jordan's map of East basin of Brewer, BULLETIN, Vol. III., No. 1.) Panorama from summit fine.

East Lake to Harrison's Pass and Stanford University Peak.— No trail (occasional traces of old sheep-trail to Harrison's Pass). From camp near mouth of Ouzel Creek go south along lake to southern shore, cross stream coming into lake from south from west to east on sheep bridge near the lake; to right through willows, and work up slope to left through trees bearing rather to right to little lake just north of Castilleja Lake; follow up (east) stream from this

lake, keeping near water (fine turf footing) to lake; take right-hand bank of this lake, and left-hand of succeeding lakes until the last (in Stanford Basin); go to right of this, follow up gully with large broken rock, and climb steep loose slide to Harrison's Pass (the right-hand slide, the one with lowest summit, the one first east of Crag Ericsson, the great crag at right); note zigzag foot-trail up this slide; from Harrison's Pass keep to left over large broken rock to summit of Stanford; first summit is Gregory's Monument (cairn with club cylinder), second is the higher, and is Stanford. Time to Harrison's Pass about three hours, to summit of Stanford about four and one half hours. Descent from summit of Stanford to East Lake camp, about two and one half hours. In no place difficult or dangerous, unless between Gregory's Monument and Stanford. Panorama from Stanford magnificent. To south is Kern River Cañon, with the great Western Divide (Table, Milestone, and Kaweahs) on its right, and Main Crest (Williamson, Barnard, Tyndall, and Whitney) on its left; view of Junction, Keith, Bradley, and University of California Peak in Main Crest to east and north fine. The great basins to west and east of Stanford impressive. For points in immediate vicinity of Stanford see Jordan's sketch-map of East Basin of Brewer, already referred to, and Bradley's map of East Creek Amphitheater (BULLETIN, Vol. II., No. 5). (See bearings of points in panorama at end of article.)

For accounts of the way from *East Lake over the Kings-Kern Divide to Mt. Williamson*, see Professor Brown's paper "Wanderings in the High Sierra, between Mt. King and Mt. Williamson," (BULLETIN, Vol. II., No. 1).

For account of trail from mouth of *Copper Creek to Tehipite Cañon* (Middle Fork of King's River), see paper by Professor Stillman "To Tehipite Valley from King's River Grand Cañon," (BULLETIN, Vol. II., No. 1).

For the sake of aiding any one climbing for the first time in the King's River Cañon region in getting acquainted with the various peaks of the region I append my compass readings (corrected for magnetic variation; local variation something startling) from the summits of three well-separated peaks, viz: Goat, Rixford, and Stanford:—

From Goat Mt.

Mt. Goddard, N.
Mt. Woodworth, 10° E. of N.
Striped Mt., 60° E. of N.
Mt. King, 126° E. of N.
Mt. Rixford, 132° E. of N.
Mt. Gardner, 138° E. of N.
Univ. of Calif. Pk., 140° E. of N.
Mt. Williamson, 146° E. of N.
Stanford Univ. Pk., 150° E. of N.
Mt. Whitney, 154° E. of N.
Crag Ericsson, 155° E. of N.
Mt. Brewer, 166° E. of N.
Kaweah Peak, 184° E. of N.
Avalanche Pk., 186° E. of N.
Grand Sentinel, 194° E. of N.
Granite Basin, W.

From Mt. Rixford.

Mt. Gould, 80° E. of N.
Kearsarge Pass, 94° E. of N.
Univ. of Calif. Pk., 112° E. of N.
Mt. Keith, 130° E. of N.
Mt. Whitney, 134° E. of N.
Mt. Tyndall, 134° E. of N.
Junction Peak, 142° E. of N.
Milestone Pk., 176° E. of N.
No. 4, 180° E. of N.
Mt. Brewer, 206° E. of N.
Avalanche Pk., 228° E. of N.
Rhoda Dome, 245° E. of N.
Mt. Gardner, 270° E. of N.
Mt. King, 300° E. of N.
Mt. Goddard, 316° E. of N.
Pivot Crag, 318° E. of N.
So. Palisades, 340° E. of N.

From Gregory's Monument.

Univ. of Calif. Pk., 26° E. of N.
Mt. Bradley, 58° E. of N.
Mt. Keith, 90° E. of N.
Junction Pk., 108° E. of N.
Mt. Williamson, 126° E. of N.
Mt. Whitney, 148° E. of N.
Kaweah Pk., 194° E. of N.
Milestone Pk., 230° E. of N.
No. 4, 232° E. of N.
Mt. Brewer, 266° E. of N.
Cross Mt., 284° E. of N.
Rhoda Dome, 316° E. of N.
Mt. Gardner, 332° E. of N.
Mt. King, 346° E. of N.
Mt. Jordan, 350° E. of N.

V.K.

INTRODUCTION.*

THE American boy demands and should receive, for his benefit and ours, an education that shall fit him to live acceptably and effectively in America. And no curriculum of English public school or German gymnasium or French lycée, however tested and developed through long years and found good in the sight of English or German or French masters of teaching, can be transplanted and thrust intact upon any American school, and that school be the best sort for American boys.

Life in America is different from life in England or Germany, and American schooling should be a particular fitting for American life. Schooling and education are got from other sources than schools, and from other men and things than professed educators. We grown-ups are still wedded to education from books and precepts from pre-

*I am indebted to Professor Vernon L. Kellogg, Associate Professor of Zoölogy, Leland Stanford Junior University, Author of Elementary Zoölogy, Insect Anatomy, Etc., Etc., for the kindness of writing this "Introduction." W. W. P.

ceptors. But give the boy his chance, and see him get educated from things and learn the laws of fit living from life and Nature! The boy is the real original investigator; he is the questioner of the realities and verities as he sees and feels them; he asks no authority better than the things that are, no stimulus to go to school to the world which he finds about him. Some direction he needs to save time and occasional dissipation of energy; some traditions it is well that he should know and respect, but give him a fair length of picket-rope for varied browsing, and if he come not to the best food for him, and that which shall nourish him to the best stature and quickest blood, he will do less than the beasts of the field, and the outcome of him, despite ever so much nursing, is to be feared.

And in this American land of old and new civilizations a-jostle, where one and the same man is to-day in the college yard at Harvard under the shadow of the traditions and the books, and to-morrow is astride the uncocked bronco on the Bar X ranch, or somersaulting

the flapjack in its warm pan near the prospect hole on the Sierran flanks, it is well that the American boy begin to learn to know Nature and Things in the same hour with his beginning to learn the alphabets of deceased, and except from school and college class-rooms, departed tongues. Nor is the American boy educated to live most effectively in America unless he gets this other and untraditional part of his education. Our country has still its frontier, its pioneer life, its "most primitive wilderness;" and its men have still to be to themselves sufficient in many and various things. That progressive civilization which specializes our life, and makes of one of us a tailor for all, and of the other a cook for all, and of the other the towncrier, has not yet and will not for long to come fasten its beneficence on all of this broad land. And in half of it the man must still be ready to care for himself in forest and on plain, on water and in desert; to care for the horse that bears him, the rifle that gets him food, the canoe that floats him over the blue depths or threads his way through the white rapids. He must

be his own cook over his own pine-cone fed fire, and know so well from long familiarity with its star-and-leaf-set hangings his sweet-aired bedroom that the outdoor night around shall not keep him wakeful with its strangeness. The American boy must learn to *do* as well as to *know* before he is educated.

Agassiz Hall is apparently a good example of a school in which boys do things; and especially do wholesome and righteous things outdoors. In that glorious and unique outing, to an account of which this wee book is devoted, that two weeks of paddling and drifting in rowboats for three hundred miles through the Great Desert, the Agassiz boys let me hear of summer camps in the Sierras, of canoeing on Tahoe, that cleanest and purest and most grandly set of American lakes, of monthly campings in the forests near the school. They discussed with animation and full technical knowledge the fatal merits of various traps; they called, in the mornings, the roll of the night's visitors about camp from the footprints on the sand and in the soft mud of the river bank; they named the

birds from their flight and their cries; they learned how to read on the faintly lettered surface of the river whether sand bar or snag or safe, deep channel lay beneath; they learned the inexorable laws of the desert and saw how plant and animal bow to these laws for life's sake. And the things they knew had come from "original sources" filtered through no stupid or sentimental teacher; and the things they learned were knowledge become a part, and a usable part, of them. Nor is the knowledge less inspiring for its practicalness, less stimulating to soul than helpful to mind and muscle.

* * * * * *

The Desert! "But what tongue shall tell the majesty of it, the eternal strength of it, the poetry of its widespread chaos, the sublimity of its lonely desolation! And who shall paint the splendor of its light; and from the rising up of the sun to the going down of the moon over the iron mountains, the glory of its wondrous coloring!" Truly, not my tongue, though with keener realization of its majesty or eyes more full of its splendrous

light than those with which I sit, these weeks away from it, no teller of its story could ask to be endowed.

And the great "silent river!" "The voiceless river! From the canyon to the sea it flows through deserts, and ever the seal of silence is upon it. Even the scant life of its borders is dumb—birds with no note, animals with no cry, human beings with no voice. And so forsaken! The largest river west of the mountains and yet the least known. There are miles upon miles of mesas stretching upward from the stream that no feet have ever trodden, and that possess not a vestige of life of any kind. And along its banks the same tale is told. You float for days and meet with no traces of humanity. * * * Slowly, patiently winding about obstructions, cutting out new channels, creeping where it may not run, the bubbleless water works its way to the sea. The night winds steal along its shores and pass in and out among its sedges, but there are no whispering voices; and the stars emerge and shine upon the flat

flow of water, but there is no lustre. The drear desolation of it!"

Where the poet halts there is left to be told simply the annals of the days, the facts of the rocks, the birds and the plants. These Mr. Price has written, and such need no introduction. And so without doing more than introduce the Introduction I was asked to write, and have not, I stop, premising only that Mr. Price tells truths in his diary, and that his companions tell only less than the truth, in expressing to him their gratitude for his leading of them to the Desert and the River.

VERNON L. KELLOGG.

Stanford University, Cal., Jauuary, 1902.

THREE HUNDRED MILES ON THE COLORADO RIVER.

IT was past midday, the 21st December, 1901, when our party of nine, in three rowboats (a black canvas boat, a red boat and a green boat), pushed off from the muddy bank of the Colorado at the town of Needles, and began our journey of three hundred miles to the southward. The smoky little railroad town was soon left behind, and we were passing through a level country clothed with a dense growth of arrowweed five to eight feet high, with now and then willows and cottonwood rising to the dignity of trees. The current was swift with many shoals and sandbars, but with a little practice we soon learned to keep the channel.

We camped a few miles below Needles on the Arizona bank, under cottonwood trees, in a dense jungle of arrowweed, young willow and thorny mesquite, in places impenetrable. After a few nights we had become adepts in hewing a comfortable camp-site in the jungle,

BIRDS OF THE HIGH MOUNTAINS.

BY

VERNON L. KELLOGG.

[Reprinted from the *Sierra Club Bulletin*, Vol. IV., No. 2, June, 1902.]

Jean Kellogg —
Carmel.

BIRDS OF THE HIGH MOUNTAINS.

By Vernon L. Kellogg.

The end of the day's steady tramping came not too soon to be unwelcome. In the beaver swamp at the cañon's mouth we had splashed for an hour; we had not scaled the rough rock-wall of a promontory which nearly closed the gorge without scratches and bruises; we had found most precarious footing over a great mass of loose, sharp rock-debris, sometime hurled in one crashing avalanche from the towering cliff-side; and the long, weary stretch of fallen pines beset with dense undergrowth had left grave doubts in our minds about the reality of the delights of mountaineering. And yet there were delights. Here in camp in the depths of the gorge, with the reaching walls inclosing and protecting us; in the soft dusk creeping up the cañon about us, while far above the glancing day still hovered; in the white banks of snow on the distant peaks, still shot across and made glorious by the sun's rays; and in the steady rhythmic plashing of the restless stream over the rounded rocks of its bed; in all these were delights. The bit of dancing flame with its tenuous line of smoke wavering up to the spruces' tops and escaping into the chill dusk above; the energetic little coffee-pot, bubbling over with sheer delight; the redolence of the sputtering bits of bacon vying with the piny fragrances in scenting the air about us; the stolid munching donkeys, lazily cropping the scant vegetation;—these incidents of a mountain camp were all delights.

There were pleasant, fresh memories of the day, too. We had decided to give this trip especially to making acquaintance with the mountain birds, and the day, as well as the days before, had been crowded with the incidents of bird-seeing. We had climbed no peaks yet, but had come slowly but steadily up from the plains, and had made acquaintanceship with the birds of the lower levels, —the lower life zones, as naturalists would say,—and were now at our last camp below timber-line, at nine thousand feet.

It is probably familiar knowledge to Sierra-Club men that the naturalist recognizes in climbing mountains practically the same phenomena of animal and plant occurrence and distribution as he does in clambering over parallels of latitude when going north or south from the tropics. Altitude equals latitude in its influence on organisms. Around the base of a great mountain in the tropics there is a lush jungle of tropical vegetation peopled by equatorial animals, a tropical life zone; above the base there is a broad circle, or zone, of sub-tropical plant and animal life; above this a temperate life zone, with its familiar genera of deciduous trees and animals of our own habitat; higher up yet comes the zone of pine-trees, running above into spruces, and fading out at timber-line in the low storm-beaten spruce and juniper "bushes," and peopled by birds and mammals unfamiliar for the most part to us, but like those of the sub-arctic latitudes of our continent. Finally, above timber-line is the true alpine zone, which, with its persistent snow-fields, its low night temperatures, and fearful blizzards, is a true arctic region. Here only low, hardy plants can cling to the rocks, or grow swiftly by the snow-bank's edge in the short, bright summer, and only a few animals, specially adapted to the severe climate, can endure. To be sure, the fauna of a mountain-top is not exactly the same as

the fauna of the arctic zone; the polar bear and musk-ox and reindeer are not found on the peak-summit, because barriers shut them off; but what few animals do live on the mountain-top are characteristically arctic in their habit and affinities, and in not a few instances we have striking examples of the actual identity of alpine and arctic animals. For example, certain butterflies have a range of distribution which is sub-arctic as regards latitude (extending clear across the continent north of the Canadian-United States boundary) and sub-alpine as regards altitude (extending far south along the summit and upper flanks of the Rocky Mountain and Sierra Nevada ranges).

Characteristic and unmistakably recognizable among the birds to be seen on a mountain trip, whether to the Sierras in California or the Rockies in Colorado, is the magpie (Fig. 1), and we found these curious long-tailed birds at the very beginning of our climb. They inhabit the lower flanks of the mountain. The magpie is so large and strikingly colored with its iridescent, bronzed-black back and white shoulders, breast, and under parts, and has such an unusual and conspicuous long tail (a foot or less) that the first glimpse of the birds makes us sure of their identity. Walter Fisher tells of the habits of the magpies about Mono Lake as follows: "Every morning saw small droves of black-billed magpies [naturalists recognize two species, one black-billed, the other yellow-billed] catching grasshoppers, and their keenest rivals at this relentless warfare were the sparrow-hawks. Usually the magpies held forth on the lower slopes of the piñon hill, where they engaged in endless squabbles from daylight till dark, the echoes of their profanity reaching me at the ranch-house where I must need spend much good time in preparing specimens. So well did these two species do their work that by the end of the week nearly

FIG. 1. MAGPIES.

Drawn by Walter K. Fisher; permission of *The Condor*.

FIG. 2. ARCTIC THREE-TOED WOODPECKER.
Picoides arcticus.

Drawn by L. A. Fuertes; by permission C. Hart Merriam, United States Department of Agriculture.

all the grasshoppers had disappeared from the meadows. It proved a very entertaining sight when the magpies chased the grasshoppers, as they occasionally would do, for their agility in dodging and circling proved how mistaken we are likely to be in forming an estimate of a bird under ordinary conditions. Usually nonchalant and absurdly dignified in their demeanor, these birds could at times assume the utmost interest in their occupation, and dart with surprising speed here and there. They used their tails about as much as their wings in flying."

Almost sure to be noted on mountain trips are birds of another extreme in size—the tiny, swift-winged humming-birds. To an Eastern bird-lover, forcedly content with a single, albeit choice, humming-bird species, the ruby-throat, the first experience of bird-seeing in the West will undoubtedly be always memorable by his "discovery" of hosts of humming-birds. The broad-tailed hummer is so abundant in the Rocky Mountains (of Northern Colorado at least, where I learned to know them) that acquaintanceship with it fairly prepares one for the comparative wealth of humming-bird life which is to be found when the Pacific Coast is reached. I do not know how many species of hummers are recorded from the Sierras (four have been found in the Tahoe region), but there are enough to provide delight to every observant mountaineer. Perhaps there are a few bird-lovers who still fondly hold to the unenlightened fancy that the humming-bird's long bill is for nectar-drinking. Be informed! Master Hummer is a blood-letting carnivore! That bill is a dagger, and a dagger with a sharper, fiercer javelin concealed inside of it. The humming-bird tongue is as exquisitely fit a fork for spearing little bugs that are sipping nectar at the bottom of deep flower-cups as nature or the wit of man can well devise.

Another beautiful strong-winged mountain bird is the

violet-green swallow, which we had seen circling about in the cañon a few miles below camp. This species is the common swallow of both the Rockies and Sierras. Other swallows, as the cliff and barn, come into the lower mountains, but they really belong in the valleys. The violet-green is the rightful mountain swallow, and, with its short, slightly emarginate tail, its pure white under parts and velvet-green back, it can be readily distinguished from the barn-swallow, with its long forked tail, or the blue-backed, rusty-bellied cliff-swallow. Violet-green may be seen skimming gracefully over mountain lakes, or wheeling and darting in cañons, anywhere in the mountains up to eight thousand feet altitude.

We had seen grouse, but had n't killed them. And this is not to the discredit of our marksmanship, but to the credit of our good hearts. For the mother grouse we startled was so obviously the mother of grouse that we held our murderous fire and refused to allow the fluttering, feigning bird to sacrifice herself, as she offered, for her young. John Muir has found the mother grouse in the Yosemite. "On the approach of danger," he writes, "the mother with a peculiar cry warns the helpless midgets to scatter and hide beneath leaves and twigs, and even in plain open places it is almost impossible to discover them. In the mean time the mother feigns lameness, throws herself at your feet, kicks and gasps and flutters to draw your attention from the chicks. The young are generally able to fly about the middle of July; but even after they can fly well they are usually advised to run and hide and lie still, no matter how closely approached, while the mother goes on with her loving, lying acting, apparently as desperately concerned for their safety as when they were featherless infants. Sometimes, however, after carefully studying the circumstances, she tells them to take wing; and up and away in a blurry birr and whir

they scatter to all points of the compass, as if blown up with gunpowder, dropping cunningly out of sight three or four hundred yards off, and keeping quiet until called, after the danger is supposed to be past. If you walk on a little way without manifesting any inclination to hunt them, you may sit down at the foot of a tree near enough to see and hear the happy reunion. One touch of nature makes the whole world kin; and it is truly wonderful how love-telling the small voices of these birds are, and how far they reach through the woods into one another's hearts and into ours. The tones are so perfectly human and so full of anxious affection, few mountaineers can fail to be touched by them."

This grouse of the Sierra Nevada is of the same species as the common mountain grouse of the Colorado Rockies. It is variously called by mountaineers blue, or dusky, or pine, or mountain grouse. They are next to the sage-cock in size of all the grouse, reaching a length of two feet. The upper parts of the old cocks are strongly slaty, or bluish-gray, while the under parts are paler, tending to white. Its nearest relative—a distinct and somewhat smaller species, however—is the Canada (or spruce) grouse of the Northwest. The dusky grouse lives mostly on the ground in forest regions, taking readily to the trees when flushed. Here it slowly moves about so as to keep behind the trunk or a large branch, or sits immovable, trusting to its protective coloration to save it from its enemies. On that account it is readily killed if seen, and because of its stolidity is sometimes called "fool-hen" by hunters. Its stolidity is anything but foolish when pursued by natural enemies. But natural selection hardly counted on the man behind the gun!

In the late afternoon, when the way began to seem unusually rough, and even the stream's rushing singing began to pall a bit, we made our best find. Audaciously

standing ankle-deep on the very edge of a little fall in the stream, a sober-mantled, plump-bodied, bright-eyed bird watched us keenly for a few moments, and then with a spray-flirting whisking of short rounded wings dashed up stream. We knew our find with the first glance. We had been told too often and had read too carefully about Mistress Ouzel's seeming and manners to be puzzled for a moment by this quickly vanishing bird-sprite. Indeed, ouzel was an old friend of mine, at least; for a half-dozen summers in the Rockies had brought us to a familiar footing. All through the mountains of western North America from Alaska to Mexico this most interesting and attractive bird is at home. Not a "water bird," as we use the term, meaning the ducks and shore-birds and all the host of related aquatic and semi-aquatic bird forms, but a thrush, a bird of the woodland songster group, that has simply left all the tradition of its ancestors and all the custom of its companions aside and has adopted the swift, cascading mountain stream for home, and the song of the stream for lullaby for its young in the rift of the stream's rock wall. There is no mistaking the ouzel; no other bird swims under water in the stream pools; no other bird stands half submerged but jauntily secure on a rocky stone in the brawl of a cascade; no other bird sings from the depths of a cloud of spray at the side of a fall. He is simply dressed in brown, and looks much like an over-big wren. He bobs and teeters, picks his way daintily over the wet stones, and is ever bold and sure. His song is not loud, but wonderfully sweet and simple.

No bird-lover who has visited the mountains fails to find the ouzel, and if the bird-lover writes, the ouzel is sure to have the major share of the "piece." Olive Thorne Miller is a special lover of the ouzel, and has observed it in Colorado long and patiently and to excellent purpose. Muir has not failed to find the ouzel in the

Yosemite, and has tried to tell of him, but comes to an eloquent stop.

In camp here in the dusk the bird-seeing for the day is over. If we were in the Rocky Mountains, however, it would not be. For we should have bird visitors,—the ghostly leering Canada jays, silently slipping from branch to branch, intently watching us. These silent white-and-gray and ashy-leaden birds of the high mountains, known variously as Canada jays (or, better, Rocky Mountain jays, as the southern bird is a variety of the northern form, the typical *Canadensis*), or "camp-birds," or "moose-birds," or, quite absurdly, "whisky-jacks," are familiar acquaintances of the Colorado mountaineer. I never roamed a day in the great spruce forest on the flanks of Long's Peak or spent a night in those still haunts of the hermit-thrush but the gray jays visited me. Far to the north on the great barrens of New Brunswick, or in the dense forests of the Northwest Territories the Canada jay is well known to caribou- and moose-hunters. The "ubiquitous rascal"—so one naturalist-hunter calls him—hovers about the camps of the hunter and disputes each crumb of bread with him. In the Colorado mountains he is no less tame, and fluttering silently down and up between ground and branch, he makes sure work of any overlooked morsels of food. Mute birds! Not a cry or call, not a clash or rustle of wings to give them reality. They would be impudent were they not so evidently exercising a proprietary right; one would talk with them were they not so plainly mere ghosts.

. . . . . .

All through the night there is singing; and there are odors. One lies drowsing and listening and breathing fragrant, soothing balms. The spruces and pines and some mintlike, square-stemmed plant, and the smooth

grass-leaves, and the nodding wind-flowers, the fresh, damp ground, and the fallen dead trunks, all breathe sweet smells. And a subtle, musty, elusive odor—is it the breath of the gray granite walls? And through the odor-weighted air the soft singing of the wakeful stream, telling of its snow-fountains on the dark summits of the range, of its creeping among the alpine buttercups which cling to the very verges of the great snow-fields, of its fearful leap over some sheer cliff to its uneven way down the cañon. A faint singing is high above on the side of the cañon; or is it the singing of the east wind among the aspen's leaves? It is a familiar singing, but whether of bird or leaf or wind one cannot say.

"Bubble, bubble flows the stream,
Like an old tune through a dream."

. . . . . .

The early gray of the mountain morning was welcomed by earlier risers than we. The brisk rapping of a red-shafted flicker at the very top of a stark, branchless spruce shaft reminds one of similar tattoos heard about our valley homes. In truth, this is the same flicker that we have in the lowlands. In the Eastern States a similar species, but with the under sides of wings and tail golden yellow instead of orange red, is the common flicker, or yellow-hammer. But yellow-shafted and red-shafted are so closely allied, and hybridize so readily, that in coming from the East to the Rockies one can collect a series of specimens showing almost a perfect transition from one form to the other. West of the Rockies the red-shafted practically supplants the yellow, and thus is the one flicker of both lowlands and mountain.

The finest and largest of the mountain woodpeckers is the magnificent log-cock. It is from fifteen to twenty inches in length, dull black all over, except for a white throat, a white line on each side of the head and neck, and

FIG. 3. AUDUBON WARBLER.
Dendroica Auduboni.

Drawn by L. A. Fuertes; by permission C. Hart Merriam, United States Department of Agriculture.

FIG. 4. WESTERN EVENING GROSBEAK.
Coccothraustes vespertinus montanus.

Drawn by L. A. Fuertes; by permission C. Hart Merriam, United States Department of Agriculture.

a splendid scarlet head-crest. The log-cock is a "wild, wary, and solitary" bird, keeping to the heavy forests, and retreating before the advance of man. Other woodpeckers distinctly mountain-inhabiting are the odd alpine three-toed forms, of the genus *Picoides*. (Fig. 2.) These woodpeckers have the first toe absent, the fourth toe being turned backward, as usual in the family. The sides of the head are striped, and the rest of the body, except the white under-parts, barred with black and white, while the males have a square yellow patch on the crown. There are three American kinds of three-toed woodpeckers, all confined to boreal or alpine habitats, and evidently all, together with the Asiatic and European species, descended from a common circumpolar stock. These birds are not so common that the finding of one should not be looked on as a real ornithological coup. W. W. Price has found them on Pyramid Peak. In several summers' tramping in the Rocky Mountains I have seen but five of the birds, and these were all near timber-line.

The singing stream, in this cool dawn, is receiving the morning visits of its friends, the birds of the cañon. Here a brilliant black and scarlet Louisiana tanager, the most strikingly colored of all the Rocky Mountain and Sierran birds, and there the delightful little olive-backed, ruby-crowned kinglet, with its one bit of dashing scarlet concealed by overlying greenish feathers. Ruby-crown's song has few rivals in the mountain forests. Another wee bird commonly to be seen here is the famous Audubon warbler. (Fig. 3.) The male in summer, all bluish above with blackish streaking, and with crown, rump, throat, and breast-sides clear yellow, is a bird of rare beauty. Two other strongly marked birds of this zone are the evening and pine grosbeaks. The beak of these birds is very large and vaulted, being nearly as wide and high at base as it is long. The evening grosbeak (Fig. 4)is dark olive-

yellow, with black tail and black wings with conspicuous white patch; the pine grosbeak is roseate or light carmine, with blackish wings and tail.

As we straggle on through the upper forest belt, intent on reaching timber-line before the sun shall have softened the surface of the broad snow-field which we must cross just above it, we do not keep that silent and sharp watch for the birds which one must if he shall see close at hand the shyer, warier denizens of the higher forest. But as careless of the tree-tops and as intent on our footing as we may be, one characteristic bird kind of the upper mountain flanks is almost certain to call itself to our attention. The Clark nutcracker, or crow, (Figs. 5, 6,) is the "ubiquitous rascal" of the High Sierra, as the Canada jay is of the high Rockies, and, as Muir has well said, is the strangest, noisiest, and most notable of all the High Sierran birds. "He is a foot long," writes Muir, "and nearly two feet in extent of wing, ashy gray in general color, with black wings, white tail, and a strong, sharp bill, with which he digs into the pine cones for the seeds on which he mainly subsists. He is quick, boisterous, jerky, and irregular in his movements and speech, and makes a tremendously loud and showy advertisement of himself—swooping and diving in deep curves across gorges and valleys from ridge to ridge, alighting on dead spars, looking warily about him, and leaving his dry springy perches trembling from the vigor of his kick as he launches himself for a new flight, screaming from time to time loud enough to be heard more than a mile in still weather. He dwells far back on the high storm-beaten margin of the forest, where the mountain pine, juniper, and hemlock grow wide apart on glacier pavements and domes and rough crumbling ridges, and the dwarf pine makes a low, crinkled growth along the flanks of the summit peaks. In so open a region, of course, he is well seen. Everybody

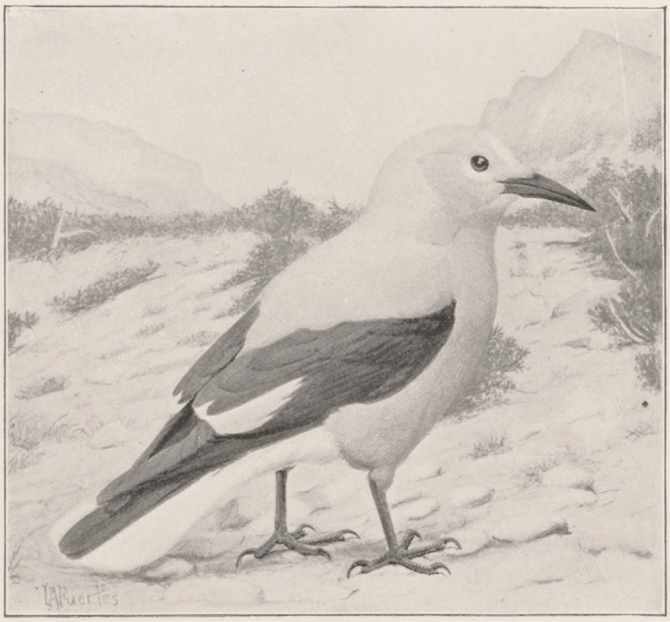

FIG. 5.—CLARK CROW.—*Nucifraga columbiana.*

Drawn by L. A. Fuertes.

(By permission of C. Hart Merriam, United States Department of Agriculture.)

FIG. 7.—WHITE-CROWNED SPARROW.
Zonotrichia leucophrys.

Drawn by L. A. Fuertes.

(By permission of C. Hart Merriam, United States Department of Agriculture.)

FIG. 6.—CLARK CROW.
Nucifraga columbiana.

Photographed by Walter K. Fisher.

(By permission of C. Hart Merriam, United States Department of Agriculture.)

notices him, and nobody knows at first what to make of him. One guesses he must be a woodpecker; another a crow or some sort of jay, another a magpie. He seems to be a pretty thoroughly mixed and fermented compound of all these birds, has all their strength, cunning, shyness, thievishness, and wary, suspicious curiosity combined and condensed. He flies like a woodpecker, hammers dead limbs for insects, digs big holes in pine-cones to get at the seeds, cracks nuts held between his toes, cries like a crow or Stellar jay,—but in a far louder, harsher, and more forbidding tone of voice,—and besides his crow-caws and screams, has a great variety of small chatter talk, mostly uttered in a fault-finding tone."

In the Lake Tahoe region, W. W. Price found Clark crows common everywhere about eight thousand feet, and on Mt. Tallac they continually pilfered his traps. Muir found them feeding their young as early as June 19th at a height of more than ten thousand feet, when nearly the whole landscape was snow covered.

As we push our way through the low, wind-beaten spruce bushes of timber-line a nervous, fluttering, finch-like bird is fairly numerous. This is the white-crowned sparrow (Fig. 7), one of the hardiest and most widely spread of all the sparrows and a familar acquaintance of every mountain-climber in both Rockies and Sierras. White-crown nests above seven thousand feet, often undoubtedly just at timber-line, and its friendly, simple, half-sad little melody comes most welcomely to one just stirring out in the cold dawn of a timber-line camp. In the Rockies I have seen white-crown well up on the peak sides above timber-line in the middle of the day. The conspicuous black-and-white-striped poll and the unmistakable "sparrow" appearance of the whole body make it easy to know white-crown when you meet him.

Above timber-line, on the steep, bleak, wind-swept

slopes of the Rocky Mountain crests, among the bare brown rocks and scattered snow-patches the mountain ptarmigan lives its lonely life. Exposed to the violent storms which sweep over the mountain summits, prey of the golden eagles and falcons which range the high peaks, the brown-and-white hen fights out for itself and young the wages of existence. With curious adaptive mimicry, the ptarmigan, in winter, when the high mountain slopes are wrapped in snow, puts on a plumage of unspotted white; but when the suns of spring sweep the brown rocks of their snow coat, leaving only the deep and protected never-melting snow-fields scattered over the summits, the ptarmigan dons a brown-and-white habit that harmonizes with the changed appearance of its mountain fields. One can rarely make an ascent above timber-line in the Rockies without seeing ptarmigan,—the upper slopes of the Front Range are thickly inhabited by them,—but the bird is yet to be seen in the Sierras. Grinnell thinks that it does not occur in the State. It is found in the Cascades of Washington and Oregon as far north as Mts. Hood and Jefferson. It seems strange that it does not come farther south.

We have come now to the very summit of the crest, to the capstone of the peak. Apparently we have passed the homes and feeding-grounds of even the bravest mountain birds. To be sure, the great golden eagle may soar royally aloft among the peaks, but its aerie is below us. We have brought ourselves on slow and patient feet beyond the range of the birds. But hold!—from the jagged cliffs of the peak's east side comes a gentle twittering, and then before our astonished eyes flutters a dainty, well-fed little bird, the gray-crowned leucosticte, or rosy finch. A chocolate-brown body, with crimson tinge, and brown to dull black crown has leucosticte, which belongs to the great family of finches, or seed-eaters, and is rather like

our common linnets. Its home is on the mountain's top, the crest's last ridge. Fluttering over snow-banks, where it reaps a rich harvest of frozen insects, or sweeping swiftly along in the strong wind, or darting into crevasses and rock-crevices for shelter, our brave little bird is a contented dweller in this truly alpine home. Far to the north on the Alaskan coast and Bering Island its cousins live at sea-level. But in this latitude leucosticte finds an arctic habitat at fourteen thousand feet altitude. On the very summit of Long's Peak (14,271 feet) in Colorado I have shared my luncheon with this hardy little mountaineer. . . . As we stand on the capstone of our mountain and look far out over the foothills and into the valley where wind peacefully the waters escaped from their mountain fastnesses, leucosticte flits over the cliff's edge and drops fluttering to the little green lake a thousand feet below. If we could drop as lightly we should be sooner home than we shall be.

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The Desert's Gold.*

BY ROBERT ROBERTS. (= Vernon Kellogg)

THE first flush of dawn touched the jagged crest of a distant range of red and yellow desert mountains — then the light sped quickly down the scarred cliffs, revealing the black depths of gulches and the cruel, sharp edges of the great volcanic rocks. At the base of the cliffs it touched the red sands and rested on them till they looked like a bed of glowing coal. And then the long, uneven floor of the mesa surface, with its scattered cacti and meagre patches of greasewood, began to show in wide, monotonous stretches. The light grew rapidly vivid and garishly colored — dawn in the desert comes quickly.

The forenoon wore slowly on, with nowhere a movement, nowhere a sound. Perhaps a coyote was skulking stealthily home from his night's ghoulish feast, but his coat of tawny gray fitted in too well with the red-gray sands — he was invisible. Perhaps a sleek-furred kangaroo rat was busy under a creosote bush, or a cactus wren was boring into the soft flesh of a giant *sahuaro* cactus, and uttering now and then a contented chirp. But in the awful immensity of the dead and silent desert such littlenesses were invisible and inaudible.

At high noon the glare and the parching heat were intolerable.

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The mountains had their tops apparently cut off and suspended trembling in the sky. Over all the level reaches of sand and rock were a dancing and vibration due to the waves of heated air. The mirage revealed now a sparkling lake, with leafy borders, and now shifted the scene to moving troops of distorted, half-distinct animals. It was dangerous to the brain's sanity to puzzle too long over these weird pictures of the desert. One looked to the pinnacled mountains seemingly so close, but really a full score of miles away, for rest and reality. Surely there could be found escape from this furnace breath and blinding glare. But when one reached these promises of respite, they would be found false. They, too, were desert; the gulches were dry and stifling; the rocks cruelly sharp and bare; the few plants as meagre and as fiercely spined and thorn-laden as those out on the mesa. Only that the sun reached the bottom of the gulches a little later in the morning and left a little earlier in the evening — that was all the betterment. No less pitiless and fatal are the fire-scorched, wind-and-sand-scarred desert mountains than the limitless wastes of the desert floor. No place for human living here.

But the high-noon sun had found a softer target for its searing arrows than the stolid lava rocks — had found targets that would suffer and did suffer, terribly and unceasingly, with every dart of the fire-tipped rays. Two bent backs of men in the strong bottom of a gulch; men, crying with pain, but cursing with joy, striking and prying with picks, clutching with bared and bleeding hands at the glass-sharp rocks, and piling eagerly into a battered gold-pan the rough yellow nuggets. Only at the very end of an eternally long and suffering yesterday had they come to the unmistakable signs of a "find." And after a feverish night of half-delirious sleeping and waking they had sprung, haggard and wild-eyed, to their dropped picks. And still half-delirious, but wholly beast-like, they raged and toiled at the resisting rocks.

For a month — an eternity it had seemed — had the two men faced the horrors of midsummer in the heart of the Mojave Desert in this desperate game with Nature for her desert's gold. And the long month's terrible struggle had bitten in. The desiccated, parchment-like skin, the parched, alkali-blistered throats, the puckered, squinting eyes with sharp, black dagger-points of pupils,

the unkempt hair, and drawn, seamed faces all told the story of physical suffering, of scanty food and long hours without water, of mental stress, of hopes raised fever-high and then chilled to despair, of reckless resolution and secret fears and foreboding, of all the physical and mental tortures that come to the man immured in the merciless desert. In the days came the glare and the burning and the monotony of red sand and blackened rocks. In the daytime, too, came the unsettling pictures of the mirage, with their constant reminder of the clear, cool lake and soft green meadow and shady grove of a long-forsaken home; in the day was the helpless toiling — the conflict with the dull rocks and the scorching sand in the awful silence and isolation. But the nights were even worse. Sleepless and feverish they tossed for half the hours, naked and oozing with perspiration on their coarse blankets, and then, falling into a fitful sleeping, made fearful by horrid whirling visions, they were wakened in the early morning by a sudden chill which struck through and through their weakened bodies. The desert night is as deceitful as the desert day is mercilessly honest.

Wilson, the older man, though long accustomed to privation and over-strained endurance, had been hardest hit — his age counted against him. His shaggy breast and arms, his great, grimy hands and matted crown of coarse hair made him look like a bear in human guise. He worked silently, except for muttered curses, but in his brain odd pictures and queer fancies flitted. He straightened himself unsteadily occasionally, and with a slow gesture threw the hair from before his eyes, and looked dazedly around. He stared hard at the great cliff sides; he turned his head slowly till his eyes rested on the little "shack" only a hundred yards away near the mouth of the gulch, and then, seemingly reassured, he bent again to his violent picking. At times, though, he would lift, to look only at his companion, working steadily by his side, and then a strange look would come into his haggard face, his pin-point pupils would contract even tighter, and a slight trembling would run over his body. "Who is this man here, taking my gold?" he thought at first; and then, after a moment, would silently answer himself, "Why, it's Charlie, of course; my pardner, Charlie Bennett."

Bennett himself took no notice apparently of the older man's occasional breaks in the work; he looked neither to side nor above; he picked and pried, his eyes fastened on the rocks at his feet. He, too, felt occasional "touches of sun" — they came more frequently than he liked — but he could still quickly pull his fleeing wits together. He had a firmly knit body and strong, hard face. He was too young to be already a voluntary exile from home and friends; but one doesn't ask questions about the early life of the desert hermits. Not that some men might not be able to answer them honestly and reveal nothing but a simple "hard luck" story, but there are other cases. Bennett's case was one of the others.

Despite his apparent unobservance of the older man's vagaries, he but too keenly realized the situation. His own condition suggested too strongly the probability of something worse in the weaker man. He was estimating just how long, or rather how short a time, they could stand the terrible strain. His brain too, like Wilson's, was busy, but most of the time it was a clear and keenly reasoning brain. Although the nuggets were numerous, he believed it was but a pocket, and that another day's hard work would exhaust it. Then they could go — go with their buckskin bags and belts laden with yellow gold. A day's tramp across the burning mesa would bring them to the great, silent river of the desert, the Rio Colorado. Through the heart of the desert wastes the great red river winds for half a thousand miles. In all this distance but two small ever-live tributaries come to it, but it is always a mighty river, carrying the waters of Wyoming, Colorado and Utah down to the sand wastes where lap the blue waters of the Gulf of California. There, on the river bank, was an Indian rancheria, and a canoe could be got. Then a long pull down through the cañons and between the mesquite and arrowwood lined banks for a hundred miles to Yuma. And then swiftly by the overland train to where the yellow gold could buy compensation for all these horrible days under the desert sun and stars.

But whatever the thoughts and visions of the men, there was no ceasing in the straining work. Automatically, like finely ordered machines, the arms lifted, the backs bent, the picks struck home. And on these bended backs and bowed heads the sun unceasingly, pitilessly, wielded its fiery scourge. As if driven by a taskmaster

with a knotted lash the men strove, gasping and dripping. Or, rather, from only one the beads of perspiration rolled — the other had a shining, dry face, and that was no good thing. But they lasted, these two, and the sight of the old gold-pan with its dull yellow freight was the meat and drink which kept these human machines agoing. And so the killing afternoon passed; the sun dropped behind a flat-topped loma, and the swift twilight came. But the sands and rocks kept up their burning; it would be far into the night before the desert oven would cool and chill.

Wilson and Bennett dropped their picks and without a word staggered down the cañon towards the shack. Bennett had moved to lift the heavy gold-pan, but Wilson, with an articulate growl, and a sudden lurch, clutched it up and carried it. With the sudden relaxation came a terrible reaction. They had not drunk for hours. Now they found their throats rough and burning, their tongues swollen. The older man kept up a constant peering into the shadows of the cañon's sides. His head swung from side to side; he muttered low to himself.

Soon they came to the forlorn little adobe cabin, with its roof and sides thatched with arrowwood packed from the distant river bank on the back of the lonesome burro which shared with them the privations of desert life. In the jungle along the river roamed a dozen other burros long escaped or turned adrift and living now half wild, a new kind of animal added to the desert fauna. After a long draught from the earthen water jar, which was packed on the burro's back to and from the river when necessary, the little fire of greasewood sticks was made, the black coffee-pot swung over it, and the few thick slices of bacon set to sputtering in the long unwashed skillet. All this was done without a word, and as automatically as the picking and prying of the long day. They were simply machines that could stoke themselves as well as do their day's work.

With supper over, came the blank. It would be several hours before the moon, now past its full, would rise. The darkness and the silence, and still the burning! Now came the visions, confused and flying, to each man. Bennett ground his teeth and clenched hard his fists. Should he break now, when the gold was found, was here on the cabin floor? One more day, and the stake

was won. He fought his madness; he rose and walked; he talked to himself slowly and carefully. He was still master; he could say over the one verse he had ever known; he could count the stars of the Great Dipper, and find the North Star; he could spell his name and Wilson's. What, by the way, of Wilson? Hadn't the old man been acting unusually queerly this afternoon? And how silent he was? Where was Wilson, anyway? If would be better to keep an eye on Wilson — he was surely breaking. Yes, the old man should certainly be watched. Not that he was likely to run off with the gold. There was the gold-pan with the nuggets on the cabin floor between the bunks. But when the desert claims a man for its own, he is no longer a man; that is, a human man. He is a beast-man or a man-beast.

Bennett smiled grimly as he mused over the frailty of the barrier between the beast and the man when the man has fought with the desert a month. He himself was too near the danger line; he had had awful glimpses of what he could become.

Then he pulled himself violently together. Wilson was gone! Engrossed in his struggle with himself, he had not noticed when the old man, ever muttering to himself, had taken his shotgun from the cabin, and gone off up the cañon in the darkness. Wilson had gone to protect the gold — his gold — up there under the jagged pinnacles. He would watch by it through the night. The coyotes should not get it, nor the flying things, nor the beasts that crawled!

Bennett was wide awake and keenly master of himself now. This was a crisis. Wilson might come back re-nerved and sane from his night's vigil, or he might come back a maniac. Perhaps a few hours of the night air might refresh him and cool off his too heated brain; he might return at any time. Bennett decided to lie down on his bunk, so as to allow Wilson to come back and not find himself too obviously watched. It might be only a humiliation for the old man, or it might, indeed, be the means of re-exciting his hallucination. So, putting the precious gold-pan by the edge of his bunk — he would take no chances even in the utterly uninhabited desert — he stripped and threw himself on the soiled rough blankets. Instead, however, of leaving his heavy revolver as usual in its holster attached to the belt hanging on the wall over

the bunk, he took it out and laid it by his side. He would be very ready for an emergency.

And then he lay awake and breathing hard in the hot night. His head seemed to get full to bursting of his blood, which throbbed like the dull, regular beating of the piston head in a cylinder. He stared wide-eyed out of the open door at and across the bottom of the arroyo to a great pillar-like ghostly *sahuaro* cactus which stood out indistinctly in the just coming moonlight. His brain filled with memories of old days, all broken into by sharp pictures of incidents in the harrowing life of the last month. He could not control his thinking, and occasionally came blanks. Then he would start. This would never do. He must not forget the vision-haunted old man alone out in the cañon. He was to watch. There was no telling what might happen. And then came the startling and nerve-racking cries and laughs of the coyotes; it was the usual song of the night, but always weird and strange and fascinating. And Bennett listened and tried to estimate how many coyotes were there to-night. This was an old play of his. Indeed, he had a curious pride in being able to satisfy himself, after careful listening and analyzing, of the exact number of gray outcasts that barked out their tangled chorus each night. And to-night it was especially tangled. Were there more than usual — or was some old member becoming more ventriloquially expert? He gave himself up to this serious matter. He was sure of three, yes, of four. There was a curious new cry, rather low and repeated over and over again, over and over and — The coyotes had sung Bennett to sleep.

Suddenly, startled, he opened his eyes. He was chilled; he rolled slowly over; his eyes were turned toward the centre of the cabin floor. It was all flooded with moonlight. Then, suddenly, a great black blotch, a shadow, was there; an odd shadow, rather like a man, a man with an arm out. He traced the shadow to the doorway; he looked up. Then he saw that there was a man in the doorway with an arm out; no, he was holding out a stick. It seemed like Wilson; yes, it was Wilson, and he was pointing the stick at him. Great God! it was Wilson aiming his shotgun at him! Like a flash Bennett, fully awakened as if by an electric shock, jerked up his revolver. And then a crashing roar, a double

crashing roar, filled the night. And when the smoke wreaths had slowly drifted out through the cabin door the moonlight showed on the bunk a naked white, still, sprawled-out thing, on which dark slowly moving lines were forming, and, huddled in a heap on the cabin floor, a black mass, moaning and muttering. The thing in the bunk was pardner Bennett, dead, and the moaning heap on the floor was pardner Wilson, with a pistol ball in his right hip.

For an hour Wilson lay on the cabin floor. He felt his hurt but little, but expected to die. Gradually, however, the pain increased, and with it came a partial clearing of his senses. What he had done came to him in part of its hideousness. But now that it was done he must get the gold, and get away from the red-blotched white thing on the bunk. He staggered to his feet, but the frightful darts of pain which shot through his hip sickened him, and he fell. But he *must* go. He crawled to the gold-pan and dragged it to his own bunk, and there he stuffed the nuggets into a small buckskin bag, that he had long used to carry specimens. He tried rising again, and by doing it very slowly and nerving himself against the fiery pain he could keep unsteadily on his feet. And now for the river, twenty miles away, and there a skiff and an Indian rower, and down to Yuma.

. . . . . .

Again it was full moon on the blazing desert. Every one of the few living things in this waste of miles was under cover; the scattered quail that lived in the dry arroyo that ran down to the river were huddled under the scant shade of a crucifixion thorn; the desert mice were in their holes, the coyotes invisible. This was no time for exposing one's self to the direct flames which heated the great oven. But again the searching sun found one living target — a black speck on the desert floor, that moved unevenly, irregularly; a living something in human guise, now half-erect, now on all fours. Something clad in rags and spined like a porcupine with the thorns of *cholla* and *bisnaga;* something with cut and bleeding hands and knees, and ever raving and cursing out of a mouth from which protruded a black, dry, swollen tongue; something clutching with raw talon a filled and heavy buckskin bag. Half of the night and half of the day had Wilson fought his

way with supernatural endurance of torture over the lava-strewn mesa. In the delirious haste of getting off with his gold, and away from that silent, distorted white thing on the bunk, he had started without a crust of hard-tack or a drop of water. And the fever of the wound and the burning heat of the sun had combined to make a half day of thirst horrible in its results. But, though utterly crazed, some strange instinct held him in a straight line toward the great river, that, once reached, could give relief and escape from all this torture and horror.

The crawling man was dragging himself up the slight ascent of a loma; he turned aside for no stone or cactus; he fought with the mighty strength of madness. The staring, bloodshot eyes were set in a rigid stare directly ahead. They sought but one thing. And as the half-naked, blistered body lifted itself on the crest of the loma, that thing was before it. The broad red flood of water was moving sluggishly along almost beneath his feet; this was the river edge of the desert floor. Below was a narrow strip of arrowwood, hardly a rod wide, and then the red water, lapping the muddy bank. With one shrill, choked cry Wilson lifted himself fully erect, stretched out his torn hands, in one of which was clutched the buckskin bag, and threw himself toward the river. The body bounded horribly down the forty feet of steep stony slope, and at the bottom lay, slightly twitching.

. . . . . .

Days after, when the coyotes came no more, the tiny, glittering, black beady eyes of the desert rats spied out the bag of buckskin, and piece by piece they gnawed it away, that their nests in the arrowwood tangle might be lined with this new soft stuff. It was a treasure trove for them! And as they gnawed, one by one small dull yellow stones rolled out of the bag and lay among the other stones of the desert's edge. These yellow bits were of no interest at all to the swift little rats. But the desert had reclaimed its gold!

Billmyer's Sprinkling Machine.*

BY GEORGE NOX McCAIN.

ILLMYER was a strategist — the bravest and the cleverest that ever set face towards the amber sunset of the Sahara. His name will live for generations in the tents of the Tuaregs. We were all ready to confess it after the danger was past and the caravan crept between the white walls that Darwar stretched forth to us like welcoming arms.

Yet no one would have supposed that a cunning out-matching that of the Arabs and a foresight unknown to his predecessors along the camel route was concealed behind such a deceptive exterior. Perhaps the small, piercing black eyes under the overhanging angry arch of scrubby brows might have furnished a clue to his cunning and daring. But we were not looking for physiological star-pointers before the caravan straggled out of Biskra — certainly not after it was all over, and the desert metropolis became to us a city of refuge.

When I left Philadelphia I carried with me certain credentials from the University authorities and a copy of a rare map outlining the site of a partially buried city a hundred and eighty miles southwest from Biskra, and thirty miles from the oasis of Darwar. I was preparing to fulfil a long-cherished design of visiting the Sahara when the Provost of the University of Pennsylvania appealed to me, as an alumnus of that institution, to go a little out of my way and look over the ruins of Hakasar as a prospective point for archæological research. I undertook the mission with considerable satisfaction, for it afforded a distinct and inspiring object, apart from the pleasure which I anticipated in my journey.

I fell in with Billmyer — Adolphe, as his clerk Josephi familiarly called him — at Constantine. He had come in by way of

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Valley experience, in which he included

On his tomb

The following poem is inscribed on Stevenson's tomb in Samoa, where he died in 1894. In its original form, the last two lines were written in a letter from RLS to his friend, Sidney Colvin in February 1880, just five months after Stevenson's fateful stint in Carmel Valley:

REQUIEM

Under the wide and starry sky,
Dig the grave and let me lie.
Glad did I live and gladly die,
And I laid me down with a will.
This be the verse you grave for me:
Here lies he where he longed to be
Home is the sailor, home from the sea,
And the hunter home from the hill.

the now-famous lines, "Home is the

LIZABETH BARRATT

lying in an upper chamber
rly naked, with flies crawling all
r me and a clinking of goat bells
ny ear, which proves to me the
ts are come home, and it will be
old bear hunter is doubtless now
Tom the Indian will come in
few minutes."

hide-covered bed in the upstairs
-sided cabin in Carmel Valley, a
erating Robert Louis Stevenson
cription in a letter to his friend
arles Baxter, on Sept. 24, 1879.

ances which led Stevenson to this
ituated on the slope of a hill far
anyon, nearly led to his demise.

of health, the 28-year-old Scottish
n in Monterey less than two weeks
t on Sept. 9 for what was to be a
The purpose was twofold: he was
from the local coastal fogs which
to his already inflamed lungs, and
have some time apart from his
Osbourne, whom he'd just traveled
see.

ad come to Monterey on a mission.

Far

No

Formerly
The Land of Sunshine

THE NATION BACK OF US, THE WORLD IN FRONT.

OUT WEST

Vol. XX, No. 4. APRIL, 1904.

SAMOA.

By VERNON L. KELLOGG.

THE PRIDE OF THE FAMILY.

SAMOA is to some people a political problem; to some a place made memorable by the four years' abiding there of Robert Louis Stevenson; and to a few others a group of tropical islands whose natural history needs exploring. To most of us, it is simply a map name—a geographical fairyland, without remembered capital, principal town or chief exports. But Samoa does have a capital—at least, in a small thatched hut, under the palms of Mulinuu village, a two-thirds naked king sits on a cocoanut-leaf mat and switches flies from the royal naked two-thirds of him with a fly-flapper. And it has a principal city named Apia, memorable as the place where an impatient hurricane blew its breath on a certain Gordian knot of World politics and made ropy spindrift of it. And lastly it has chief exports, the name of which is that magic word of South Sea tales, copra. Volcanoes make the mountains and gorges and solid land of Samoa; two hundred inches of rain a year and an ardent tropic sun make its wonderful forest and bush and graceful palms; the "coral insect" makes its white shore-line and cruel reefs; while

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copra makes its enduring smell and is responsible for its civilization. About it all is the abiding presence of the Ocean. From every vantage point one sees the blue water meet the blue sky. Ever in one's ears is the low growl of the water beaten back by the guarding reef. In every direction is it ocean-wide away to the World!

Samoa, a few tiny land specks in a waste of blue waters, became a political problem simply because in that neighborhood three world-powers rubbed elbows, i. e., the muzzles of six-inch guns. As a business proposition, the islands are not worth even the most refrained and by-your-leave sort of elbowing. All the copra that all the seductive wiles of all the traders of Samoa can get together is worth, gross, something less than half a million a year. And beyond copra the exports of Samoa consist of cheerful talk about some hoped-for cacao. A Morgan would keep the accounts of Samoa among the "miscellanies" in the back pages of his pocket note-book. But where world-powers touch elbows, each must come away the winner by something from the others. And so came to pass Stevenson's "eight years of trouble in Samoa," followed by more years of the same, upon which the sympathetic eyes had closed forever. If the gobbling of the little in this world by the great is inevitable, then the final obsequies of free Samoa were probably not the worst that might have been arranged. But in the long, senseless, criminal making ready for the finish, great mischief was done. The Samoan people, an impressionable and quick-seeing race, learned to know the white man in his lowest estate; saw him a petty wrangler, a disciple of sharp practice. The Samoan found, besides, that, sharp as the white man was in his practice, he was by no means immune from being played a bit sharply himself. So the common, native, untutored wit of the brown man began to try itself out against the schooled diplomacy of the white. And now the Samoan civilization, of the "beach," is a shining example of what we can do—but ought not—for the brown man when we undertake his burden for him. The voyager on the San Francisco-Sydney liner, who spends his few hours at Pago Pago in being rowed about the fairyland harbor, and thinks to reward his three-parts-naked, savage boatman with an obviously-colored bandanna kerchief or a four-bit Barlow knife, will learn that unsophistication is not synonymous with nakedness.

But the world politics of Samoa is presumably settled now. The final decision of arbitrator King Oscar officially and publicly affirms our shame. We are to pay in eagle-stamped tokens for our misbehavior in one of our too-eager imperialistic flights.

The proprietary interest of the United States in Samoa today consists of the ownership, by agreement with Germany and England, and by direct cession from the natives, of two tiny islands known by the soft Samoan names of Tutuila and Manua. In Tutuila is the admirable harbor of Pago Pago, a great crater with one side, the harbor mouth, broken out to open ocean. Here we have established a naval coaling station, building a wharf, coal sheds, store-house, customs office, and commandant's residence. Long before our ownership of Tutuila, which came about when Germany and the United States divided the Samoan islands, Great Britain giving up Samoan interests for value received in the Tongas and Fijis, we

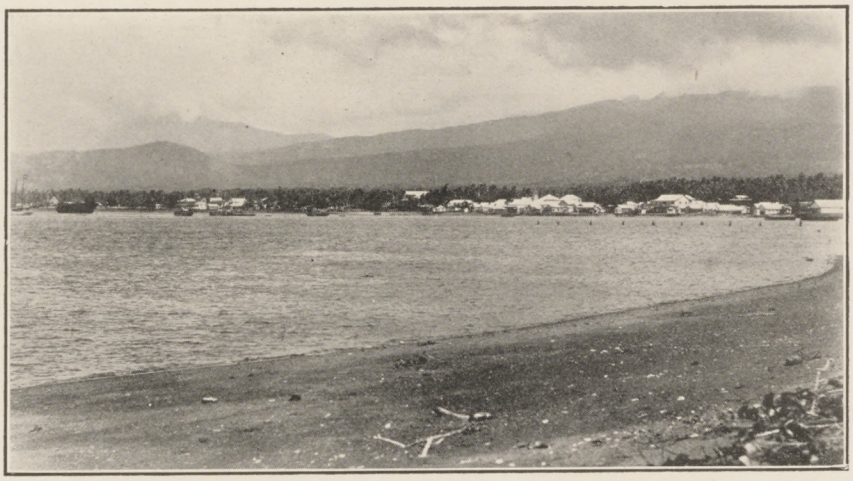
PAGO PAGO HARBOR.

had received the coaling-station concession from the Samoan kings. Indeed Pago Pago is our first over-seas colonial holding, our first imperialistic venture. The ruler of American Samoa is the commandant of Pago Pago station; at present, Capt. U. Sebree, than whom there will be no better. Capt. Sebree's beneficent tyranny is better compensation for our early mischief than all the money King Oscar commands us to pay.

Of the present political relation of this tiny American colony to the mother country, the less said the better. For nothing very understandable can be said. The simple trouble is, that the colony-managing officials of a nation which has colonies but has no provision for their government, are apparently left to their own devices—to manage "somehow". In the case of Tutuila the managing so far seems to be a successful policy of

trusting largely to the personal representative of our government, the naval commandant of the port. But without precedent of statutes the commandant has, at best, a ticklish berth. Fortunately honesty, common sense and vigor may well supply the place of tradition, established policy and diplomatic training. And the present commandant has these native qualifications in good measure.

To reach our picturesque American colony of cocoanut palms and breadfruit trees one has simply to embark on one of the Oceanic Company's San Francisco-Sydney liners, and enjoy a pacific voyage of two weeks. One day of the fourteen is spent in Honolulu; time enough to drive through summer showers to the picturesque, wind-swept mountain pass of the Pali, to have a surf bath at Waikiki and tiffin at a good hotel. On the



HARBOR AND TOWN OF APIA.

fourteenth day your ship steams slowly into the mouth of Pago Pago crater, and you realize that you have exchanged oak trees for cocoanut palms, prunes for bananas, and tailored men and women for scantily girdled children of nature. Still, the first child of nature I met on Pago beach was smoking a fat cigar and carrying a lantern and a disreputable umbrella. But his clothing was a lava-lava of tapa (mulberry-bark cloth), and his skin was brown and shone with cocoanut oil. He was a Samoan in process of making over into an American. He wanted to sell me a war club which he had whittled out since seeing the steamer's smoke, and he could say "damn."

Away from the beach, though, (and "beach" means only that part of the shore line of a South-Pacific island invaded by whites), the Samoan native is a glorious specimen of kindly,

UNDER THE BREAD-FRUIT TREE.

honest, care-free, wholesome, child-witted, primitive man. Almost uniformly superbly developed physically, holding up straight and free six feet of stature, and looking from clear eyes out of open, intelligent faces, the Samoan men are among the finest of the anthropologists' living specimens. Never confound the tall, brown, straight-haired Polynesians of the Marquesas, Society, and Samoan Islands with the under-sized, wooly-haired, black "boys" of most of the hundreds of South Sea islands in Micro- and Melanesia. They are races apart. The Samoan women have the same attractive race-characteristics, but their physical development is not so uniformly good

as in the men; the anthropologist, if collecting "methodically at random," will capture more undesirable specimens in the gentler sex.

The missionaries have mostly conquered the South Seas. In each little village of toadstool huts, the biggest mushroom of all is "mijinery house"—South Pacific for church. And Sunday is a day, the South Pacific over, devoted to earnest howlings of adapted gospel hymns by fantastically clothed barbarians. A Samoan attends from four to seven services each Sunday, beginning at seven o'clock in the morning. He comes dressed in a white lava-lava, white-duck jacket, fly-flapper, and serious countenance; she comes in a gaudy Mother-Hubbard, gaudier little green-ribboned, blue-feather chip hat, and white-

In the "Bush."

toothed smile. Each carries a cocoanut-leaf mat to sit on and hymn book to sing from. All can read, and all can sing. It is mostly singing, though a vociferously spoken sermon by the native preacher finds its appropriate place. And the singing is tuneful for the most part, and oh, so heartily enjoyed. Any South Sea islander will praise God (perhaps any god) willingly if he may sing his praises. And the missionaries have wisely found this line of least resistance.

The missionary and the results of his labors are the subject of constant debate the world over. In the South Pacific the

A Samoan Bungalow.

missionaries have wrested the natives from the hands of adventurers and beach-combers, speaking by and large. But they have delivered the natives into the hands of an awful enemy of tropic-people, called Clothes. From Monday to Saturday he and she have gone healthfully, naturally and without self-consciousness mostly undressed. The swift showers have beat on their oiled, naked shoulders and limbs as harmlessly as on the duck's preened plumage. The perspiration induced by the tropic sun has swiftly and coolingly evaporated as fast as it oozed out. But on Sunday the cheap cotton clothing is put on to make him and her self-conscious and immodest, and to lie

soaked with rain, or between showers with perspiration, in sticky folds over the body. Result, morally disastrous self-consciousness, and physically disastrous pneumonia. Truly it is a question whether clothes do not carry the natives as swiftly and certainly into the presence of their new-found God, as does the awful heritage of loathsome disease bequeathed them by the dissolute whalers and beach-combers of pre-missionary days. What in the name of sane things have indecent Mother Hubbards and appalling green-ribboned chip hats to do in the great work of leading tropical heathendom to Christianity?

From Monday to Saturday, with no church services to en-

On the Beach.

gage the attention, our Samoan compatriots mostly do nothing! They get a little foretaste of Sunday's pleasures by holding repeated and protracted choir-practice in the evenings, and they are busy enough, in a way, on the infrequent steamer days. There is business then in fans, seed necklaces, tapas and war-clubs. The exigencies of life also demand a certain irregular gathering of breadfruit, green cocoanuts and taro. Indeed the taro has to be mildly cultivated. And then there are the chief exports to be looked after. As the production of copra, however, consists of a long waiting for the cocoanuts to ripen and fall to the ground (sometimes they are climbed for), then in a short working spurt of cracking them open, cutting out the

"meat" in small strips, and spreading these strips out in the sun, with another waiting for the sun to cure them, and finally getting them into sacks and to the beach to be picked up by traders' boats, it is obvious that even the responsibility for the statistics of chief exports leads to no very strenuous life. Samoan days are chiefly a pleasant monotony of "dolce far niente." On the Pago wharf and around the coal sheds, there is usually plenty of hard, grimy work to do, and this is done by imported Tongans. Over in the island of Upolu, where the great German trading and planting firm has thousands of cocoanut palms for copra production and constant need of laborers, the work is done by wiry, little, frizzle-haired "black boys" from the Solomon Islands. And only last summer the German governor went to Berlin to get the imperial permission to import the world-conquering Chinese coolie into Stevenson's fairyland. But after all why should the Samoan carry tons of coal into and out of black and unlovely holds of ships? He might get fifty cents or a dollar a day—to be spent for things which he can mostly get for nothing. His rain and sun are reliable; the cocoanut palm and bread fruit, the taro bulb and kava root grow lush and swiftly. And they give him his food and drink, his modest wardrobe, his toadstool house, and his material for tourist war-clubs. The veteran trader Moore—friend, adviser and business man of Robert Louis Stevenson—says pithily: "A Gilbert Islander wakes in the morning naked, hungry and thirsty. He rises, climbs a cocoanut tree, and comes down clothed, fed and drunk." Why then should he carry coal?" Perhaps there are abstract reasons why every man should carry coal; but to the Samoan the concrete ones are lacking, and the others haven't led to action.

There are customs and scenery in Samoa, and there is natural history. But the editor of Out West would hardly allow me to describe new species of bugs or fishes, or to catalogue the formal etiquette of kava drinking and council meetings, in these pages. Kava, the national drink of Samoa, is non-alcoholic, but has its own peculiar manner of intoxication when drunk in large quantity. The drink is made by simply pouring water over the freshly pounded-up dry roots of a plant of the pepper family. The liquid is drunk immediately, not being allowed to ferment, as often stated in books. The effect is due to the presence of an alkaloid, which produces first a local anaesthesia of the throat, then a slight stimulation of the mental faculties, and if much kava is drunk at one sitting, a loss of control of the legs. But it can be used moderately with apparently little harm. Around its drinking much ceremonial has gathered,

Lake Lanuta—In an Old Crater on Upolu Island.

A Trail Through the "Bush."

and one of the most delicate adjudications of the American commandant last summer was in the matter of a neglect of ceremony to the chief of one of the American islands by the chief of the other.

The council meetings with barbecue accessories are the occasion of much speech-making, all done by official "talking men" and usually at long range, the orators standing about fifty yards apart, and leaning on long staves. At the banquet succeeding one of these oratorical displays I had the fortune to sit near the attractive queen of Tutuila. The banquet board, which was made of great, smooth, fresh banana leaves was covered with roast pigs, chickens, fish, squid, breadfruit, taro, and polisami (a mixture of taro tops and milk of green cocoanuts). The

VAILIMA IN STEVENSON'S DAY.

queen asked me if I would "have a bit of chicken." I would, but wondered how she would carve the bird, as there were no knives in sight. But the carving was easy. Taking firm hold with both hands, one vigorous jerk carved the fowl in two, and two more jerks rended it into four pieces.

The wondrous picture of tropic forest and palm-fringed shore, of fern-banked cascades and cloud-wreathed mountain tops cannot even be suggested by my lame pen. Tahiti and Eimeo are said to be the most beautiful of South Pacific islands, but Upolu and Tutuila are ocean gems exquisite enough to satisfy all of the South Sea voyager's expectations. Abrupt mountain masses, rising green and sun-lighted out of a blue

ocean, and ringed with the thin white line of breaking waves on the outer reef edge—they are choice emeralds set in the great tropic circle.

Lastly, in Samoa are the one-time home and haunts of Stevenson, the Vailima Tusitala. And there, on the summit of a spur of Mt. Vaea, are his ashes. Pushing back and up from the Apia beach along a road that is a veritable tunnel through plantations of cocoanut, bread-fruit and banana, one comes, after a warm hour's tramp, to Vailima, now owned by a hospitable German, and considerably enlarged since Stevenson's death. Over the wide-verandahed house lifts the steep side of Mt. Vaea, and up this winds the narrow zig-zag path hewn out of the tropic bush that densely clothes the whole mountain. A thousand feet above Vailima, one comes suddenly out of the

bush on the open, narrow, flat top of the mountain. Here is the low simple grave-stone, made after the fashion of the Samoan chiefs' tombs, and bearing on one side in Samoan, Ruth's speech to Naomi:

> Whither thou goest, I will go; and where thou lodgest, I will lodge; thy people shall be my people, and thy God my God; where thou diest, will I die, and there will I be buried.

and on the other Stevenson's own verse,

> Under the wide and starry sky,
> Dig the grave and let me lie.
> Glad did I live, and gladly die,
> And I laid me down with a will.
> This be the verse you grave for me:
> *Here he lies where he longed to be,*
> *Home is the sailor, home from the sea*
> *And the hunter home from the hill.*

A Village Under the Cocoanut Palms.

A Samoan Club Woman.

The tropic sun bathes the hill-top in warm light, the bright-feathered birds sing loudly in the nearby bush, the little lizards lie content on the gray tombstone. One looks far down to Vailima and across through the clear air space to distant higher mountains, equally green and inviting. A pair of pure white tropic birds float slowly far above Vailima. To the north the slopes, covered with great cocoanut plantations, stretch down to Apia and its crescent harbor. Enclosing the green water of the harbor is the white reef-line, and the low muffled roar of the charging breakers persists even here. And beyond stretches the measureless blue water of the tropic Pacific, out and up to the sky line. Everything is beautiful and bright; nothing sombre, nor soiled, nor ugly. The world, from Stevenson's grave, is full of beauty and clean life, as it ever was when seen through the brave and hopeful eyes of the living poet.

Stanford University.

NIGHT WIND, WAKE!

By MARY AUSTIN.

NIGHT Wind wake! now the cattle leave the trail for us,
Huddled on the hill slope by the stony water-scar,
Get you down along the steep
Where the moon-eyed gilias keep,
To go walking in the meadows—
Silver runnels in the meadows—
Where the blossoms star the shadows and the hidden waters are.

Night Wind wake! now the laden vine is calling us,
Calling with the incense of its green and misty blooms,
Now the milk-white alders quake
Where the dark lies like a lake
On the musky scented meadows,
On the many-lilied meadows,
On the chilly mountain meadows where the throaty hylas blooms.

Night Wind wake! I am coming up the trail to you,
Up and past the gullies where the midnight shadows lair
Past the tangle by the creek
Where the trail is all to seek,
To the damp and dusky meadows,
To the willow-skirted meadows,
To go walking in the meadows with the pleasant Night Wind there.

Independence, Cal.

COLLECTING ON A CORAL REEF

By Professor VERNON L. KELLOGG

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COLLECTING ON A CORAL REEF

BY PROFESSOR VERNON L. KELLOGG
STANFORD UNIVERSITY

ONCE every three weeks a 6,000-ton steamer leaves San Francisco for Sydney. You sail with it six days from gray and cold water to warm and blue, and touch at Honolulu. They let you off for tiffin with *poi* "cocktails" in a hotel hanging over the sliding surf on wondrous Waikiki. You make the swift drive up the showery Nuuanu Valley past the tombs of the Kamehamehas and the flower gardens of the *lei* sellers, to the Pali, where you look over the ridge of the island and see the ocean on the other shore. Then you come back and reembark. Six days more—due south these days and the water all blue and the days all warm and the equator crossed on the fourth day—and you whistle hoarsely in front of a lone mountain towering out of the tropic ocean. Then, as you have knocked, you move slowly in at the open door of a great water-filled bowl, which is simply the yawning crater of a dead volcano that makes all there is of Tutuila, a microscopic island appanage of these imperial United States.

The sides of this bowl, which are the inner faces of the crater, lift swiftly for two thousand feet above the water, and are all clothed and made soft by the velvet-seeming tropic bush that clings to every climbing yard. Around the water's edge runs a narrow strip of gleaming coral sand, and here are the toadstool native house and the white government buildings of the port village, Pago-Pago. Here too are the dense, dark-green heads of bread-fruit trees and the gently curving, lazily swaying, slender trunks of cocoanut palms holding up their heavy feather-duster tops. And along this beach stroll the loafing, chattering, friendly Samoans with their naked shoulders shining with fresh anointment of odorous cocoanut oil and loins encircled with the gaudiest of *lava-lava*. For this is steamer day, and there are unsophisticated, globe-trotting, amateur antiquarians to be sold ancient war clubs to,—clubs hastily whittled out and dented and smoke-blackened since our hoarse whistle sounded before the crater's gate.

But for our coral-reef collecting we are going to the larger German island, Upolu, with its harbor town Apia, made memorable by the great hurricane of '95 which turned warring factions of English, German and American sailors on warships and Samoan braves on shore into common savers of one another's lives. The children of nature showed their God-head in that terrible day and night, and the republican presi-

dent of eighty millions of people did no more than recognize the brotherhood of man when he sent Seeumanu, sturdy, half-naked chief of a few hundred brown barbarians, the gift of a rich boat to commemorate the day of revelation.

Now Upolu, whereon sits Apia, is about eighty-five miles away from Pago-Pago on Tutuila where the American steamers touch, and so we must descend from the high decks of our 6,000-ton Sydney packet to the spray-wet planks of the *Kawau,* inter-island messenger and carry-all. I had long had my misgivings about these last eighty-five miles of our ocean voyaging from San Francisco to the Samoan reefs. And these misgivings were not abated when I ventured to ask the captain of the *Ventura* something of the figures, as to tonnage and knots, of his little ocean sister, the *Kawau.* Quietly and unexplosively he expectorated over the gunwale of the upper deck where we stood.

"Sir, if the *Kawau* were alongside I could spit into her funnel from here," said he. Inelegant, perhaps, but sufficiently expressive to give me forthwith a symptom.

It was even so. Thirty-five is the *Kawau's* tonnage figure. The boats that the bare-legged Paris children sail in the round pool of the Tuileries gardens look larger and roomier to me than the *Kawau* as I recall these two types of vessels now. But our reef lay eighty-five miles away across the heaving swells of a trade-wind irritated ocean. And the *Kawau* was the only boat going our way. So we transshipped. Boxes and bags went into a tiny cavity amidships called cabin. We sprawled *faa Samoa* (native-wise) on the salt-encrusted deck. My own seat was a coil of tarry rope on the stern grating. As the swift tropic twilight fell we issued from the harbor's mouth and rode full tilt against the first great swell. All night were we a-jousting. We had, from the start, hardly any symptoms. It all looked too dangerous to waste time or handicap oneself with seasickness. The soft tropic night wore on, while we momentarily expected the apparently certain overwhelming. Far in the middle of the long dark hours, as we slid about on the slippery deck, face to the strange new star pictures of the southern sky, the captain came aft, surrendering the wheel to a native roust-abou—ah, quartermaster, and, opening a microscopic cellular deck-closet, went in, leaving the little door ajar. Soon streamed out a fitful light and the extraordinary sounds of a cheap gramophone, singing "Lead, Kindly Light"! Even the captain had apparently lost all hope!

With the first soft gray light of morning we stared hard to port where land should lie. Soon the lifting shores of Upolu took form. We nosed through a narrow opening in the fringing reef and hove-to in a shallow bay bordered shoreward by a flat crescent of white sand beach. Along this beach we could pick out, in the swiftly growing light, the low white houses of Apia. Behind the houses was the dense green mass

of the tropic bush sloping upward and broken here and there by the towering even lines of the great cocoanut plantations. Still higher rose the volcanic ridge and peaks that make the roof of the island. The nearer of these forest-covered peaks, lying immediately behind Apia, is Mount Vaea, Stevenson's mountain. On a shoulder of this dark green mountain is Stevenson's grave, with its low, flat tomb like those of the Samoan chieftains. And under this grave-crowned shoulder, lying beautifully in a little open space amid tall trees, is Vailima, the house of the five streams. There are no longer five streams there, but only two, which come trickling down the long hill slopes to pour their slender threads of fresh water into Apia harbor.

A bustling German customs house officer clambered aboard and we went through the formalities of civilized travel. They were less irritating than usual, and soon we were free to choose among the eager naked-backed boatmen that clamored in the water about us like sea gulls quarreling over ship's refuse. Waiula, old grizzle-haired, strong-faced, sinewy-armed Waiula, claimed us by virtue of his special insistence and our natural deference to age. We rowed in past the great rusted hulk of the German warship *Adler,* lying beached on the reefs, conspicuous relict and reminder of the awful hurricane, and made our way, sleepy-eyed, exhausted and despondent to a two-story frame building on the beach, conspicuously labeled "Tivoli Hotel." Here we sat, silent and helpless, until coffee could be made. With coffee and breakfast and a morning nap, the world was new again and we turned our eager attention to the problem before us, that of getting acquainted with the life of the coral reefs.

The islands of the Pacific are of two types; either all made of coral, or mostly made of volcano with fringing coral reef. Indeed the "all coral" islands are only so on top, for they are simply volcanoes whose summits do not project above the water's surface, but do come near enough it to support a persistent coral growth. This builds up on its volcanic support an atoll or islet rising a few yards above the ocean level. The more striking and beautiful islands are volcanic peaks which lift their great masses for four or five, seven or eight, even for thirteen or fourteen, thousand feet above the water. Most of these volcanoes are dead, but some are alive, as Mauna Loa on Hawaii and the recently reopened and still flaming volcano on Savaii of the Samoan group. But practically every volcano island has its coral reefs, either fringing or barrier or both. Like a ring of Saturn the flat-topped band encircles the volcano's waist at the ocean surface, and in the shallow waters and innumerable pools on the reef the naturalist finds a rich collecting ground. We paid close attention to the tides, and every day the ebb would find us working on the half-exposed reef, prying into crevices, breaking up dead coral masses, wading the green water, and ever scrap-

ing intimate acquaintance with uncouth crawling things of the sea, made visible for an hour in their shallow prison pools. Not all uncouth, either, for of marvels of color and pattern, bizarre and beautiful, there was never lack.

In echinoderms, that is, star fishes, brittle stars, sea-urchins and sea cucumbers, the Samoan reef is very rich. I think we took some two dozen species. An abundant star fish is ultramarine blue, with slender, smooth-surfaced rays. A curious large, reddish-brown, ugly-seeming kind has heavy coarse spines an inch or more long, scattered over it, and these spines sting. Many specimens of the brilliant blue star fish were found with arms slightly or badly mutilated, but all regenerating. I have some specimens by me now which show that even a part of a single arm can regenerate all the rest of the body, that is, a new disc and four new arms besides the remainder of the single mutilated arm.

Of slender-rayed brittle stars there are brown and green and mottled sorts, some with white cross bands on each arm, and all with the fragile arms breaking away with the least roughness in handling. Often merely the contact with the preserving fluids seems to be sufficient for a general epidemic of arm-shattering. Among the sea urchins a kind with very slender, long, almost needle-like spines is abundant. These spines are not only sharp, but stinging, and often a warning tingle told the exploring hand in crevice or pool bottom of the presence of this well-protected little urchin. Another slender-spined sort has white bands around each spine, so that the thickly beset body is black-and-white barred. A larger kind has its heavy spines each encircled by two or three rings at small distances apart. Still a larger species shows heavy, thick, blunt spines much like miniature baseball bats.

We were not the only sea-urchin collectors on the reef. With each low tide would come forth a score or more of natives, mostly half-clad women and children, who would wade about in the shallow water of the reef and among the scattered pools collecting choice tit-bits for an evening feast. Among these morsels a certain sea-urchin seemed to be favorite. Often the collectors could not restrain their appetites and would crack open the brittle tests, and suck out and swallow raw some choice inner part.

The sea-cucumbers were very abundant; they lay scattered over the whole reef top, in some places one to every square foot. A large greenish-black form about ten inches long, with four-sided body, and unusually firm body wall with short blunt tubercles; a soft-skinned dark-brown form about six inches long when not extended, but capable of great extension, found between tide lines under stones; and a small spotted brown and white kind three to four inches long, were the three most abundant species; but several other kinds were common, among them a small black knobby sort, the real *beche de mer* of the Samoans.

Collecting sea-cucumbers is easy, but preserving them is not. Rough handling of any sort and above all the plunge into the preserving fluid inevitably caused the cucumbers to eject from the mouth opening a considerable portion of their insides, comprising most of the esophagus, stomach and intestines. This extraordinary behavior tended both to ruin the specimens and to make a rather messy lot of preserved material. Occasionally not only cucumber stomach would come out, but also an active and astonished little live fish. This fish, called *Fierasfer,* seems to have adopted for more or less permanent home the inside of sea-cucumbers. It is a slender, active, bright-eyed little creature which has certainly displayed an extraordinary cleverness in the life-and-death game of hide and seek with its enemies.

Octopuses and squids came to be familiar acquaintances in the reef pools. None of these were large, the pulpy, sack-like body of the largest octopus found being perhaps not more than a foot long, with arms of twice that length, but with its staring eyes and hooked beak and sucker-armed tentacles even a small octopus looks very ferocious and capable of making serious trouble. The squids with their power of ejecting a dark fluid, discoloring all the water in the pool so that nothing could be seen in it, had the further protection of concealment. We scientific collectors were hard pressed in our search for octopuses by the food-hunting natives. These devil-fish are much sought for by natives and are reputed to taste, when cooked, much like chicken. The most effective way of rendering the octopus harmless and helpless in its collector's hands is that of turning it inside out, which is a means regularly practised by the natives. It seems to require, however, a particular knack which we never learned.

There were, of course, hosts of crabs, little crabs, middle-sized crabs and big crabs; red and green and polka-dotted. Rather frightening at first were the active, foot-long *Squillas* with sharp knife-blade claws. Even more terrifying was a specimen (brought to us by a native) of the great cocoanut crab, *Birgus.* These tough customers have a body seven or eight inches across, and great long strong legs extending a foot on either side. Their shell was of the hardest and their grasping claws of the strongest. They spend most of their time in the cocoanut plantations, feeding upon the fallen nuts. Just how they get at the tender meat inside the cocoanut shell is more or less a question. The natives tell you that the great crab climbs a cocoanut tree, snips off a cocoanut, thus letting it fall heavily three or four score of feet to the ground. It perchance falls on a stone, but even if not it is likely to be broken, anyway. The crab, descending, then tears open the cracked shell and scoops out the rich food. Perhaps this extraordinary crab does this thing. We never saw it. But that it feeds upon cocoanuts is quite cer-

tain. Its flesh is much prized for salad and has a distinct flavor of the nut.

Of the multitude of reef-inhabiting shells and their variety one can not even venture to speak. The natives use many of the smaller gasteropod shells in making necklaces. Often these little shells are strung alternately with red or yellow seeds. The many cowries attract attention, particularly a small white one with light-brown black-bordered ellipse which is the most abundant shell on the reefs. A large fluted shell, called by the Samoans *faigua,* is not uncommon, and its flesh is eaten raw by the natives. Many of the shells housed active little hermit crabs, and as we worked about the pools there was a continuous rapid scuttling about of these strangely tenanted houses.

Less familiar animals were the various marine worms, brilliantly colored nudibranchs and the unsavory looking fleshy masses of large pteropods. One of these salt-water worms looked almost exactly like the familiar fuzzy brown caterpillar of the Isabella moth that scurries about across our sidewalks and pathways in winter time. The most extraordinary, as well as the most famous, worm of the Samoan reefs is that curious creature called the palolo, which with a certain phase of the moon in November of each year appears in myriads in the shallow reef waters and is gathered with feverish haste by the natives as the choicest food of the whole year's finding. To be accurate, they are not the worms themselves which thus appear, but only certain parts of the worm body, the egg-producing parts, which break off from the rest of the worm, lying in crevices in the reef far below the water's surface. Mayer has recently described the similar habits of an Atlantic palolo common on the Dry Tortugas.

As for the "coral insects" themselves, they have been so often pictured and so much written about, that their graceful shapes and marvelous colors are familiar to all readers. As a matter of fact, we saw curiously little of live coral, and that which we saw was by no means brilliantly colored. The live zone of a coral reef is that part on its outer or seaward margin where the surf is always breaking and the water is pure and clean. The great mass of the reef is composed of dead coral, the shattered, crushed and compacted lime skeletons of millions of dead individuals, and this rock mass, this limestone ledge, is of dirty grayish or brownish white with no beauty of color at all.

Where we did see all the marvel of color and pattern that one must find on a tropic coral reef, or be sadly disappointed, was in the deeper, larger pools near the seaward edge of the reef. Imagine all the most brilliantly colored and strangely patterned tropic butterflies that you have ever seen pinned up in dead rows in museum cases alive and disporting themselves in clear water! You have before you then in your mind's eye no more extraordinary or beautiful sight than that actually

afforded by the butterfly fishes of the pools of the tropic coral reefs. Robin's egg blue and indigo, green and cadmium yellow, red, brown and softest rose, scarlet, crimson, magenta, lavender and royal purple, pink, salmon and tawny—all these colors laid on in dots and spots and splashes, in lines and bars and polygons, and you have the paints and the painting of the fish harlequins of the pools. Flashing back and forth, lurking under projecting stones, rushing into dead coral heads and coming reluctantly half paralyzed to the surface as we used the collector's favorite methods, this display of fantastically colored fish life was the most conspicuous feature of each day's seeing.

Off the reef in the deeper water were larger fishes and many of them too also extraordinarily colored and patterned. The parrot fishes with their blue and green ground color and their livid pink and salmon and rose markings were every-day prizes of our divers. The taking of the off-shore fish (in water from two to six fathoms deep) had an element of excitement in it. Small dynamite sticks were exploded in the water to stun the fish and make them easily captured by the naked divers. In one end of a small, wobbly canoe would stand a native with a dynamite stick in one hand and a slow-burning piece of wood, or better, a lighted cigar, in the other. Leaning down backward in the extreme other end of the canoe would be the naturalist! When we reached a good position he would light the short fuse of the explosive and holding it almost to the last moment before explosion (much as a boy holds on to his big firecracker on Fourth of July mornings) he would hurl it overboard. The explosion would take place a few feet under water, and on the moment in would plunge the active divers from a second canoe. Altogether, in our short two months collecting, we took more than five hundred species of fishes from the reefs and shallow adjacent waters of the two Samoan islands. Of these fully one hundred are species hitherto unknown to naturalists.

Of the long, glowing days under the ardent southern sun; of the soft, odorous tropic nights; of the feastings and council meetings with the friendly, hospitable natives; of our glimpses between working hours of the lotus-eating life that makes even the shortest stay in the tropics a fascinating memory and that leaves an ever-persistent longing; of all this there is no space for even a word. We have only now to pack our boxes and specimen cases, to send a stirring petition to the Commandant at Pago-Pago to save us from another ocean trip in the *Kawau* by sending the American gunboat for us, and to make final transshipment to the great Sydney-San Francisco liner, to make an end of our summer's work and play.

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INSECTS OF THE PACIFIC

PROFESSOR VERNON L. KELLOGG

WHEN one speaks of the insects of the Pacific, they are the insects of the Pacific shores and Pacific islands that one refers to. For with all the amazing adaptiveness of insects to variety of habitat and habit, and with all the pressure of enormous numbers of species and individuals to drive them far and farther and into all the available places of earth, the insects have, curiously, so far not invaded the oceans. Although they constitute of known living animal kinds a full two thirds, perhaps three fourths, they are restricted in habit to but one third part of the earth's surface, to wit, its dry land and fresh and brackish waters. The real salt sea is tenantless of insects. A few long-legged surface-treading kinds are found on ocean waters far from land, but these are really inhabitants of surface sea-weed patches, which, like their fresh-water cousins, the familiar water-striders or skaters of ponds and quiet stream-pools, can run or glide quickly over the water's surface, denting but not breaking the supporting surface film.

There are also a few small kinds which haunt the beaches and rocks between tide lines for sake of the rich harvest of food thrown up by the waves. Such a kind is a little long-legged fly with atrophied wings, which lives on the headlands of the California shore in the Monterey Bay region. When the tide is out it runs actively about, looking like a small slender-bodied spider, over the rough, damp rocks between tide-times, seeking bits of organic matter thrown up by the waves that dash over the rocks at high tide. When the waters come back these odd little flies seek refuge under small silken nets they have spun across shallow depressions in the rocks. They cling desperately to the under side of the protecting silken mesh, while the great waves dash and break over them. Of course they are much of the time actually submerged in salt water. But they stand it.

Recently a similar and closely allied fly has been found on the shores of bleak South Georgia Island in the South Atlantic about 500 miles east of Patagonia. And another tide-rock fly of like habits is known from the cold and tempestuous Kerguelen Island of the South Indian Ocean.

The insects of the Pacific Islands are, however, more conspicuous by the kinds familiarly known all over our continent than by the sorts peculiar to the islands. In fact, what with the same old house-flies and blue-bottles, mosquitoes and fleas, cockroaches and bedbugs, and other familiar close companions of man, the insect fauna of a Pacific island or of the Pacific coast of America is likely to be disappointingly familiar and familiarly troublesome.

But this familiar character of the first seen and most often seen insects of the Pacific points an important moral to the student of insect distribution and of insect troubles. It is the moral of man's personal aid in the wide dissemination of insect pests. Wherever he goes, by wagon, train or ship, he carries the pests with him, colonizes them wherever he settles, and supports them in their new homes by his own presence and the presence of his domesticated animals, his quickly planted grains and vegetables, fruits and flowers.

So the casually inquisitive visitor to Pacific lands will find himself irritated by the same kind of fleas, mosquitoes, buzzing flies and biting flies, nocturnal bed-fellows, the same old croton bugs and black beetles and the rest that he knows in the east and middle west.

They have all come to California and Oregon and Washington, and gone on to the Hawaiian and Samoan and Philippine Islands, just as many of them came from Asia to Europe and Europe to the Atlantic and went on to the Mississippi Valley in earlier years. And this emigration and immigration by the side and with the aid of man accounts for a considerable and, from the economic point of view, a very important part of the Pacific insect fauna. For most of the worst insect pests of California and the rest of the Pacific coast are imported and comparatively recently imported species.

The most important single group of insects to the citrus and deciduous fruit growers of California are the scale insects (Coccidæ), small, degenerate, specialized, wax-covered and protected sap-sucking creatures, of hardly the seeming of an insect at all. The San José scale, the cottony-cushion scale, the black scale, the soft brown scale, the red orange scale, and all the rest of the scaly crew are ever threatening clouds on the fruit-grower's horizon. And he spends annually much time, energy and money in fighting back the swiftly multiplying hordes of these pests.

Now practically all of them are natives of other lands; they are man-aided immigrants into California. The San José scale, that once threatened the whole deciduous fruit interest of California, came from China about 1875. The cottony-cushion scale that similarly once threatened all the citrus orchards came from Australia about 1868. And the story of the coming, and settling, and finding the country good, of several of the other kinds is as well known.

But, fortunately, the economic entomologists have learned something to their advantage from this kind of insect immigration. They have learned deliberately to hunt for and import good bugs to fight the bad ones. For example, it was discovered that the Australian cottony-cushion scale, so dangerous a pest in this country, was not so dangerous in Australia, and this because of the active efforts made there by a certain kind of little black-and-red lady-bird beetle known as the vedalia. The

scale pest had got carried to America without its vedalia enemy, and, accordingly, found California in truth the promised land. Now what more common-sensible than deliberately to import and colonize vedalia in the California orange and lemon orchards? Which was, accordingly, done, and done easily and successfully, so that here, as in Australia, vedalia keeps the cottony-cushion scale insect within practically harmless bounds.

Naturally such a success has led to many other attempts in many other similar cases. Perhaps no other success has been so marked as the now classic first one, but much other success there has been, both on the Pacific coast and on Pacific islands, notably Hawaii, and also in the eastern states. The great fight against the imported foliage and forest tree pests of New England, the direful gipsy and brown-tail moths, is resolving itself more and more into a search for and colonizing of their natural parasites in Europe and Japan.

Another type of good bug brought to the Pacific coast by deliberate importation and carefully nursed to an effective colonization is the curious little fig-wasp, *Blastophaga,* by whose means the "caprification," *i. e.,* pollination, of figs depends, on which depends, in turn, the full size, sweetness and the nutty flavor of the best commercial figs. The fig is a hollow but fleshy receptacle with many minute flowers inside. The *Blastophaga* eggs are laid in the ovules of these flowers, and there the tiny grub (larva) lives and feeds and changes finally into a little chrysalid, and then adult. The adult male *Blastophaga* is a curious deformed wingless creature, and remains in the fig of its birth until it dies. But the female is a winged active insect that leaves its natal and cradle fig and flies to others to lay its eggs. Curiously, it can find suitable egg-laying places only in the wild or so-called capri figs and so does not leave eggs in the cultivated figs, but in walking about over their flowers it dusts them with pollen brought from the fig last visited, and thus produces the necessary cross-pollination. As the *Blastophaga* lays no eggs in the domestic figs, it is necessary to keep a few wild fig-trees growing in or near the orchard.

But not all the Pacific coast insects are excessively bad bugs or excessively good ones. Some call for attention because they are just beautiful, or singular, or of unusual habit or habitat. And these are likely to seize the interest of most of us more certainly than the pests. For, after all, our interest in nature is not primarily one of dollars and cents. It is one of curiosity and of "wanting to know."

A matter that lends California's fauna and flora a special interest to naturalists is the peculiar biogeographic situation of the state. Biologically, California is essentially a large island, shut off by barriers of actual water on one side and by hot desert and high cold mountain ranges on the other, with the ends also nearly similarly barred by desert

and mountain. This results in her showing the characteristics of an island fauna and flora, with their numerous monotypic plants and animals, unique, solitary kinds, developed in isolation and under special local conditions. California's insect fauna, therefore, includes many unique species and genera, and even a few families, not found elsewhere on this continent, not even in other neighboring states. This makes it an exceptionally happy hunting-ground for the insect-collector and systematist.

But not only does its biological isolation give an exceptional interest to its insect kinds, but its extraordinary topographic and climatic diversity introduces unusual and highly contrasted conditions in insect living and, through environmental influence, produces strange kinds of specialization of structure and habit. For example, the brave little butterflies (*Chionobas*) that live on the summits of the Sierra Nevada are bound to attract our attention, for their nearest cousins (other species of the same genus) are similar butterflies confined to the summits of the Rocky Mountains, 1,000 miles away, and Mt. Washington in New Hampshire and Mt. Katahdin in Maine, 2,000 miles farther. These lonely mountain-top butterfly kinds are good illustrations of the fact that altitude can replace latitude in distribution. And they undoubtedly owe their marooning on widely separated peaks to their neglect to follow the retreating glaciers of the close of the Great Ice time northward, remaining, instead, in these isolated alpine regions where conditions have remained practically glacial.

The California mountains, especially the Coast Range, have another especially interesting group of insect inhabitants in a curious small family of delicate, long-legged, stream-haunting flies called net-winged midges (Blypharoceridæ). Although scattered widely over the world in mountain regions, hardly more than a score of species are known, of which almost one half are peculiar to the Pacific coast. Their immature life is passed, as larva and pupa, in the swiftest and clearest of mountain streams, clinging by strong little sucking pads to the smooth rock bottom on the verge of a fall. The larvæ die if they happen into slow or stagnant water, and many of the delicate flies are torn away by the current and lost as they emerge from the pupæ. But, nevertheless, with all this restriction of life to certain narrow and dangerous conditions, the net-winged midges, like the water ouzels, near whom they domicile, maintain a successful existence to add to our interest in the mountain streams.

Another interesting group of insects, well represented in California and very sparingly elsewhere in this country or anywhere out of the tropics, is the family of termites, or white ants (Termitidæ). Indeed, out of the seven species known to occur in the United States, but one is found in the east, the other six being limited to the southwest and

Pacific coast. Three species occur in California, of which two are common and constantly met with. One (*Termopsis augusticollis*) is unusually large, and makes its communal nests in fallen pine-trees, telegraph and telephone poles and other dry wood. I have found colonies containing thousands of individuals in fallen trunks of the great trees of the Sierran forest.

Another group of interesting insects unusually well represented in California are the gall-flies (Synipidæ) which form the galls, or, better, stimulate the trees to form the galls, on oaks. Seventy species of these odd little flies have been listed for the state, and there are others in Oregon and Washington. As each species has its own special kind of gall, the oak-trees of the Pacific coast often bear a curiously variable load of "fruit" besides the acorns.

I should like to speak of some of the west-coast insects of unusual appearance or pattern, the kind that catch the eye of the most casual traveler, such as the giant, tarantula-killing, bronze-winged, blue-black Pepsis wasp, that indulges in battles-royal with the big hairy tarantulas and trap-door spiders, which themselves, though not insects, are near enough related to them to warrant mention in any account of our insect fauna. But I may not. I may not speak for them at all except to say that California will match its insects against the similar fauna of any other state for interest and opportunity for fascinating observation and profitable study.

THE PHYSIOLOGICAL ASPECTS OF CALIFORNIA FOR THE BOTANIST

By Professor GEORGE J. PEIRCE

IT is almost absurd to speak under one title of a region which forms the Pacific coast of the United States for a distance equal to that from Key West to New York, which extends from sea-level to almost three times the height of Mt. Washington and from the Pacific eastward as far as Utica lies from the Atlantic. But geography and topography merely make, with the assistance of other factors, those complexes which we call climate and soil. There are, therefore, all sorts of climate from sub-tropical to Arctic,—air which ranges from dripping to dry, water which is sweet and water which is brine, growth which is constant the year round or as regularly periodic as winter and summer in the intemperate parts of the "temperate" zone. There are districts in which the daily range in temperature is greater than the seasonal range, soil which bakes to brick and soil which blows in the breeze, and, in places, light which in amount and in composition is equaled in few other parts of the known world.

If we summarize these statements we shall see that, so far as plants are concerned, it is the condition and the amount of water in air and soil which is the most striking factor in their environment. Water is not only an indispensable food material and the medium in which all the other food materials enter the plant, but it also regulates the kind and the quantity of light which reaches the earth's surface. By so doing it regulates the prevailing temperatures also, possibly to a greater degree than many of us realize.

Water, a simple, stable compound chemically, we seldom think about, taking it for granted when we have it, grumbling when anything interferes with its supply either in quantity or convenience. The average attitude of civilized man to water is similar to his feeling about the daily newspaper. He thinks little or not at all about the labor of mind and body involved in the regular delivery of the daily paper at breakfast-time at his front door. And if he thinks of water at all, it is only liquid water, of which he demands a supply ample and safe, at his hand by the turn of a faucet. Yet this flowing water is only a small part of what he needs. The water in the pipes is but a small fraction of the total upon which not only his comfort, but also his very life depends. The water in the soil, brought thither as snow or rain, or by stream and possibly by irrigating ditch, is vastly more necessary than the water in

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HEADQUARTERS NIGHTS

BY VERNON KELLOGG

I

WE do not hear much now from the German intellectuals. Some of the professors are writing for the German newspapers, but most of them are keeping silent in public. The famous Ninety-three are not issuing any more proclamations. When your armies are moving swiftly and gloriously forward under the banners of sweetness and light, to carry the proper civilization to an improperly educated and improperly thinking world, it is easier to make declarations of what is going to happen, and why it is, than when your armies are struggling for life with their backs to the wall — of a French village they have shot and burned to ruin for a reason that does not seem so good a reason now.

But some of the intellectuals still speak in the old strain in private. It has been my peculiar privilege to talk through long evening hours with a few of these men at Headquarters. Not exactly the place, one would think, for meeting these men, but let us say this for them: some of them fight as well as talk. And they fight, not simply because they are forced to, but because, curiously enough, they believe much of their talk. That is one of the dangers from the Germans to which the world is exposed: they really believe much of what they say.

A word of explanation about the Headquarters, and how I happened to be there. It was — it is no longer, and that is why I can speak more freely about it — not only Headquarters but the Great Headquarters — *Grosses Hauptquartier* — of all the German Armies of the West. Here were big Von Schoeler, *General-Intendant*, and the scholarly-looking Von Freytag, *General-Quartiermeister*, with his unscholarly looking, burly chief of staff, Von Zoellner. Here also were Von Falkenhayn, the Kaiser's Chief of Staff, and sometimes even the All-Highest himself, who never missed the Sunday morning service in the long low corrugated-iron shed which looked all too little like a royal chapel ever to interest a flitting French bomber.

But not only was this small gray town on the Meuse, just where the water pours out of its beautiful cañon course through the Ardennes, the headquarters of the German General Staff — it was also the station, by arrangement with the staff, of the American Relief Commission's humble ununiformed chief representative for the North of France (occupied French territory). For several months I held this position, living with the German officer

detached from the General Quartermaster's staff to protect me — and watch me. Later, too, as director of the Commission at Brussels, I had frequent occasion to visit Headquarters for conferences with officers of the General Staff. It was thus that I had opportunity for these Headquarters Nights.

Among the officers and officials of Headquarters there were many strong and keen German militaristic brains, — that goes without saying, — but there were also a few of the professed intellectuals — men who had exchanged, for the moment, the academic robes of the *Aula* for the field-gray uniforms of the army. The second commandant of the Headquarters town was a professor of jurisprudence at the University of Marburg; and an infantry captain, who lived in the house with my guardian officer and me, is the professor of zoölogy in one of the larger German universities, and one of the most brilliant of present-day biologists. I do not wish to indicate his person more particularly, for I shall say some hard things about him, —or about him as representative of many, — and we are friends. Indeed, he was *Privat-docent* in charge of the laboratory in which I worked years ago at the University of Leipzig, and we have been correspondents and friends ever since. How he came to be at Headquarters, and at precisely the same time that I was there, is a story which has its interest, but cannot be told at present.

Our house was rather a favored centre, for 'my officer,' Graf W., — he always called me 'my American,' but he could no more get away from me than I from him, — is a generous entertainer, and our dinners were rarely without guests from other headquarters houses. Officers, from veteran generals down to pink-cheeked lieutenants, came to us and asked us to them. The discussions, begun at dinner, lasted long into the night. They sat late, these German officers, over their abundant wine — French vintages conveniently arranged for. And always we talked and tried to understand one another; to get the other man's point of view, his *Weltanschauung*.

Well, I say it dispassionately but with conviction: if I understand theirs, it is a point of view that will never allow any land or people controlled by it to exist peacefully by the side of a people governed by our point of view. For their point of view does not permit of a live-and-let-live kind of carrying on. It is a point of view that justifies itself by a whole-hearted acceptance of the worst of Neo-Darwinism, the *Allmacht* of natural selection applied rigorously to human life and society and *Kultur*.

Professor von Flussen — that is not his name — is a biologist. So am I. So we talked out the biological argument for war, and especially for this war. The captain-professor has a logically constructed argument why, for the good of the world, there should be this war, and why, for the good of the world, the Germans should win it, win it completely and terribly. Perhaps I can state his argument clearly enough, so that others may see and accept his reasons, too. Unfortunately for the peace of our evenings, I was never convinced. That is, never convinced that for the good of the world the Germans should win this war, completely and terribly. I was convinced, however, that this war once begun must be fought to a finish of decision — a finish that will determine whether or not Germany's point of view is to rule the world. And this conviction, thus gained, meant the conversion of a pacifist to an ardent supporter, not of War, but of *this* war; of fighting this war to a definitive end — that end to be Germany's conversion to be a good Germany, or not much of any Germany

at all. My ' Headquarters Nights ' are the confessions of a converted pacifist.

In talking it out biologically, we agreed that the human race is subject to the influence of the fundamental biologic laws of variation, heredity, selection, and so forth, just as are all other animal — and plant — kinds. The factors of organic evolution, generally, are factors in human natural evolution. Man has risen from his primitive bestial stage of glacial time, a hundred or several hundred thousand years ago, when he was animal among animals, to the stage of to-day, always under the influence of these great evolutionary factors, and partly by virtue of them. But he does not owe all of his progress to these factors, or, least of all, to any one of them, as natural selection, a thesis Professor von Flussen seemed ready to maintain.

Natural selection depends for its working on a rigorous and ruthless struggle for existence. Yet this struggle has its ameliorations, even as regards the lower animals, let alone man.

There are three general phases of this struggle: —

1. An inter-specific struggle, or the lethal competition among different animal kinds for food, space, and opportunity to increase;

2. An intra-specific struggle, or lethal competition among the individuals of a single species resultant on the over-production due to natural multiplication by geometric progression; and,

3. The constant struggle of individuals and species against the rigors of climate, the danger of storm, flood, drought, cold, and heat.

Now any animal kind and its individuals may be continually exposed to all of these phases of the struggle for existence, or, on the other hand, any one or more of these phases may be largely ameliorated or even abolished for a given species and its individuals. This amelioration may come about through a happy accident of time or place, or because of the adoption by the species of a habit or mode of life that continually protects it from a certain phase of the struggle.

For example, the voluntary or involuntary migration of representatives of a species hard pressed to exist in its native habitat, may release it from the too severe rigors of a destructive climate, or take it beyond the habitat of its most dangerous enemies, or give it the needed space and food for the support of a numerous progeny. Thus, such a single phenomenon as migration might ameliorate any one or more of the several phases of the struggle for existence.

Again, the adoption by two widely distinct and perhaps antagonistic species of a commensal or symbiotic life, based on the mutual-aid principle, — thousands of such cases are familiar to naturalists, — would ameliorate or abolish the inter-specific struggle between these two species. Even more effective in the modification of the influence due to a bitter struggle for existence, is the adoption by a species of an altruistic or communistic mode of existence so far as its own individuals are concerned. This, of course, would largely ameliorate for that species the intra-specific phase of its struggle for life. Such animal altruism, and the biological success of the species exhibiting it, is familiarly exemplified by the social insects (ants, bees, and wasps).

As a matter of fact, this reliance by animal kinds for success in the world upon a more or less extreme adoption of the mutual-aid principle, as contrasted with the mutual-fight principle, is much more widely spread among the lower animals than familiarly recognized, while in the case of man, it has been the greatest single factor in the

achievement of his proud biological position as king of living creatures.

Altruism — or mutual aid, as the biologists prefer to call it, to escape the implication of assuming too much consciousness in it — is just as truly a fundamental biologic factor of evolution as is the cruel, strictly self-regarding, exterminating kind of struggle for existence with which the Neo-Darwinists try to fill our eyes and ears, to the exclusion of the recognition of all other factors.

Professor von Flussen is Neo-Darwinian, as are most German biologists and natural philosophers. The creed of the *Allmacht* of a natural selection based on violent and fatal competitive struggle is the gospel of the German intellectuals; all else is illusion and anathema. The mutual-aid principle is recognized only as restricted to its application within limited groups. For instance, it may and does exist, and to positive biological benefit, within single ant communities, but the different ant kinds fight desperately with each other, the stronger destroying or enslaving the weaker. Similarly, it may exist to advantage within the limits of organized human groups — as those which are ethnographically, nationally, or otherwise variously delimited. But as with the different ant species, struggle — bitter, ruthless struggle — is the rule among the different human groups.

This struggle not only must go on, for that is the natural law, but it should go on, so that this natural law may work out in its cruel, inevitable way the salvation of the human species. By its salvation is meant its desirable natural evolution. That human group which is in the most advanced evolutionary stage as regards internal organization and form of social relationship is best, and should, for the sake of the species, be preserved at the expense of the less advanced, the less effective. It should win in the struggle for existence, and this struggle should occur precisely that the various types may be tested, and the best not only preserved, but put in position to impose its kind of social organization — its *Kultur* — on the others, or, alternatively to destroy and replace them.

This is the disheartening kind of argument that I faced at Headquarters; argument logically constructed on premises chosen by the other fellow. Add to these assumed premises of the *Allmacht* of struggle and selection based on it, and the contemplation of mankind as a congeries of different, mutually irreconcilable kinds, like the different ant species, the additional assumption that the Germans are the chosen race, and German social and political organization the chosen type of human community life, and you have a wall of logic and conviction that you can break your head against but can never shatter — by headwork. You long for the muscles of Samson.

II

The danger from Germany is, I have said, that the Germans believe what they say. And they act on this belief. Professor von Flussen says that this war is necessary as a test of the German position and claim. If Germany is beaten, it will prove that she has moved along the wrong evolutionary line, and should be beaten. If she wins, it will prove that she is on the right way, and that the rest of the world, at least that part which we and the Allies represent, is on the wrong way and should, for the sake of the right evolution of the human race, be stopped, and put on the right way — or else be destroyed, as unfit.

Professor von Flussen is sure that Germany's way is the right way, and that the biologic evolutionary factors

are so all-controlling in determining human destiny, that this being biologically right is certain to insure German victory. If the wrong and unnatural alternative of an Allied victory should obtain, then he would prefer to die in the catastrophe and not have to live in a world perversely resistant to natural law. He means it all. He will act on this belief. He does act on it, indeed. He opposes all mercy, all compromise with human soft-heartedness. Apart from his horrible academic casuistry and his conviction that the individual is nothing, the State all, he is a reasoning and a warm-hearted man. So are some other Germans. But for him and them the test of right in this struggle is success in it. So let every means to victory be used. The only intelligence Germans should follow in these days is the intelligence of the General Staff; the only things to believe and to repeat are the statements of the official bureau of publicity.

There is no reasoning with this sort of thing, no finding of any heart or soul in it. There is only one kind of answer: resistance by brutal force; war to a decision. It is the only argument in rebuttal understandable of these men at Headquarters into whose hands the German people have put their destiny.

One evening we had a larger and more distinguished dinner group than usual. The Duke of ——, a veteran of 1870 and very close to the Kaiser, altogether a personage, had come by motor with a small staff from his headquarters near the Champagne front. My officer was all of a flutter with the importance and excitement of the event. He coached all of us — orderlies, myself, and resident guests — as to our proper behavior during the visit. This was to consist chiefly of much stiff standing up, repeated formal bows, and respectful silence. No one was to start anything on his own initiative. We were to take the conversational cue from His Highness. The *Commandant-professor* of jurisprudence was there, and a casual baron or two, and various headquarters officers.

The duke entered, to find us a fixed row of effigies, hands on trouser-seams, eyes front, chins up, in the receiving-room. His Highness was a small bewhiskered gentleman, very abrupt and disconcerting in manner, but not at all stupid, and very ready to express his opinions on all subjects of war and church history, his hobby.

As he surveyed the row of effigies his keen eye spotted the ununiformed American, and he directed a questioning look toward Graf W., the host. My officer made a concise explanation of the situation, which the duke acknowledged with a grunt of understanding and the sharp question, —

'But does he speak German?'

Graf W. hastened to declare, '*Wie ein Eingeborener*'—like a native, — which is far from true. Another grunt of satisfaction, a critical stare of examination, and finally a direct phrase of formal recognition. I reserved any exhibition of my fluent German, and merely bowed. My officer gave me an expressive look of approval and found a later chance to congratulate me on my 'success.' I suppose not being ordered out of the room may be called success, under the circumstances.

After giving the whole row a final looking-over, His Highness mumbled something, whereupon an aide-de-camp stepped briskly up, clicked heels, and held out to him a small box containing several medals on yellow ribbons. They were the insignia of some minor order in his duchy. He presented one to one of the barons, one to the commandant-professor of jurisprudence, and one to — my officer's chief

orderly, who acted as house barber and head waiter! The baron and professor had done their best and deepest bowing, but when Müller's turn came, it was like morning gymnastics in the bedroom. 'Touch toes ten times with finger-tips, legs remaining unbent.' I fancied that the baron and professor became less satisfied with their honor, the more Müller waxed enthusiastic. In fact, they did not put on their orders immediately; Müller did. Finally, my officer got our barber to stop bowing, — the duke was n't even seeing him, — and we went into the dining-room.

At dinner the personally conducted conversation leaped suddenly from church history to Zeppelining. It was just after one of those earlier London raids, when the great city was practically defenseless, and the German newspapers had been full for several days of accounts of the enormous damage and losses of life achieved by the raid. As a matter of fact there were some horrors — not extensive but intensive horrors: women and babies in several houses, and an omnibusful of passengers in a by-street, sickeningly mangled and murdered.

The duke declared that Zeppelining was stupid and the men who ordered it fools. The table was struck silent. A duke close to the Kaiser might say such a thing, but no less a personage. Zeppelining had been declared wise and good by the General Staff and the Berlin official publicity bureau. It was therefore wise and good. So one of the barons ventured to remonstrate. It was the one who had received his order along with Müller, and in whom the champagne had perhaps let some obscure natural feeling of resentment get the better of the well-learned feeling of proper gratitude for his dubious distinction.

'But His Highness will recall,' said the baron, 'the military advantage of Zeppelining: the value of holding guns and gunners in England which might otherwise be sent to the battle-line, and the blowing up of munition factories, and the — ah — the terror and the — well, the military advantage generally. One must not consider the — ah — other side of the matter. A few — ah — non-combatants, perhaps, but the military advantage, that is the sole criterion.'

His Highness snorted audibly and visibly.

'That is, of course, all that one does take into consideration. It is precisely and only because there is no military advantage in Zeppelining that it is stupid and the men who order it are stupid pigs. We don't blow up any munition factories, and for every miserable woman killed, hundreds, aye, thousands of Englishmen rush into the army to come over to the front and fight us. We are doing their recruiting for them.' He fixed the squirming recipient of his yellow ribbon with a cold gray eye. 'We are all only thinking of the military advantage. What are a few — oh, pouf, why talk of it? My dear baron, I am perhaps as much a military man as you' (this was withering scorn: the baron was the Headquarters reader of foreign newspapers!), 'and I repeat: Zeppelining is bad, and it is bad simply and entirely because it has no military advantage.'

That ended Zeppelining for the moment, until unlucky I — Well, the very next subject introduced was the attitude of the neutral world, America in particular, toward Germany. The newspaper-reading baron suddenly turned to me.

'Why is this universal hate of Germany? Why do you Americans hate us?'

It was too soon after what I had just heard. I blurted out, —

'For things like the military advantage of Zeppelining.'

My officer gave a scrape and a lurch; something tipped over. Then he stared — all of us stared — at the duke. His Highness did not order me to the firing squad or even to the cells. He did nothing, said nothing, to show any displeasure. He looked steadily and thoughtfully at me, and then gruffly indicated his pleasure that the company should rise from the table. My officer recovered his color and his equanimity.

I believe that His Highness knew that answer all the time. But the rest did not, and they do not understand it now. 'Military advantage,' 'military expediency' — how often have these phrases blocked us of the Relief Commission in our efforts in Belgium and North France! No mercy, no 'women-and-children' appeals; no hesitation to use the torch and the firing squad, deportation, and enslavement. And it is all a part of Professor von Flussen's philosophy; the pale ascetic intellectual and the burly, red-faced butcher meet on common ground here. And then they wonder why the world comes together to resist this philosophy — and this butchery — to the death!

III

Late one afternoon we left Headquarters to dine with General von R. down near the Champagne front. Mr. Hoover, Chairman of the Commission, and Mr. White, of its London office, had come over to Brussels and on to Headquarters for a conference in connection with our work in Northern France; and so we were all to go with my officer and two or three other men of the General Staff to receive this special attention from a commanding general at the front.

We made an imposing procession in three big gray military cars running swiftly to the south. As the general's chief of staff, who had come to Headquarters to escort us personally, spoke no English and did not like to hear English spoken, he took me alone with him in his car. He was a taciturn crusty major, with a thin, stern face and tight lips.

His first remarks were certain direct questions about conditions in London and England. I could reply only that, if such questions were asked me in England about Germany or German-occupied territory, I would not answer them. He did not like it, but after a little bullying settled into moody silence, occasionally broken by curt remarks to me, and brutally put instructions to his soldier chauffeur. It was evident that he did not like the idea of his general's showing this high courtesy to the intruding Yankees. It was not a pleasant excursion for any of us, and yet it was a beautiful two hours' ride over smooth tree-lined roads, — the trees are mostly gone now, — through picturesque country of wide outlooks.

Just at dusk we climbed slowly up a gentle hill-slope. As we reached the flat summit and sped along over it, one could see the road stretching far ahead, a gently irregular white line dipping out of sight into a valley in front, but reappearing on the farther up-slope and running there straight away into invisibility. Just at the horizon, where the hilltop met the heavens and the road disappeared, the tower of a little church silhouetted itself against the darkening blue of the evening sky.

'That is the road to Rheims,' muttered my companion. 'You can see it from that church.'

I thrilled. The road to Rheims! Rheims just there in front, and a shell bursting over it — over the Cathedral, say — could be seen from that little church. I wanted to go right on along that white line to that hilltop.

Later I really did go there, and beyond it even to the very verge of the sad city itself. There is an extraordinary little village of cellars — the houses above are mere stone-heaps — just behind the German trenches in front of Rheims. These cellars are occupied by two hundred and thirty-three women and girls, sixty-seven children, and four tottering old men, the total remaining population of a once picturesque and crowded village. We wanted them to come away, and be housed farther back from the line. But they prefer to live 'at home.' And so we have fed these women and children there two years. They live in their cellars, with the shells moaning back and forth over them whenever there is 'desultory artillery firing before Rheims.'

As we were running swiftly over the flat hill-summit with the long view in front of us, our driver, without being instructed — and cursed — by the major, suddenly slowed the car, and I noted the major staring hard at a soldier's grave by the roadside. There had been hard fighting all about here and the graves were numerous along the way. My companion turned abruptly to me, with a thumb-jerk toward the grave.

'He was my best friend,' he said gruffly; and with another jerk to the front, he added, 'And my brother lies under the shadows of that church-tower there on the hill.'

I forgave him his gruffness.

Arrived at the general's headquarters in a French industrial town now half in ruins, we walked by a stiff row of orderlies into a spacious house, and were shown by other orderlies and a young lieutenant to an upstairs room to brush off the white chalk-dust of the Champagne road. My officer had remained below. Suddenly he came into our room, excited and with a face of much concern. He told us swiftly that a translation of President Wilson's latest note, a short and sharp one, had just been telephoned to the general from Berlin. And the general and everybody downstairs were violently incensed. He wondered whether one of us had not better get suddenly ill, so that we should have to go back at once without staying for dinner.

This seemed absurd. We said that the general could get ill and call off the dinner if he wanted to, but we should not. Poor Graf W.! He had been trained to abuse his subordinates and cringe before his superiors, and it was really a horrible position for him; he felt, in a way, responsible for his Yankees, and he wanted the occasion to go off pleasantly. However, we had not written the note, or done anything except come, with no anticipations of pleasure, to eat dinner with the general! And so we insisted on going down.

It was a strenuous meal, not because of an overabundance of things to eat, — it is a long time now since there has been too much to eat in Germany, even among generals, — but because of the situation. The general and his staff were always polite, but never more than that. They were perfectly correct and perfectly reserved. We talked much and said little. The general declared an interest in 'caring for the people.' He was trying to reëstablish the industries of the region, he said. I had noted the stacks of two factories smoking as we entered the town. Such sights in Belgium and North France have been unusual for two years, and attract attention. I said we were very glad to learn of his interest, and asked what the factories were. He turned to the gentleman on his other side. But a less discerning young officer across the table said they were making corrugated iron. This is an article much used in and behind the trenches.

There is also much cutting of trees — French trees — and sawing of lumber going on in occupied France. Wood is also much used in the trenches. And large herds of cattle are being pastured in French pastures. They are German cattle for the soldiers. The French cattle have long ago been eaten by them.

I suppose all this is just war. But when such things are given the color before the world of 'restoring the industries of the people,' the specific object of this restoration should be told. The bald truth is that Governor von Bissing's repeated declarations of rehabilitating industries in Belgium, and the similar statements of the General Staff for Northern France, are equivocations. What has been strongly attempted has been a forced exploitation of the people for German military advantage. It has been resisted by the simple but brave and patriotic workingmen of the occupied territories with a success that seems incredible in the face of the guns and deporting trains all too familiar to them. It is true, as has been said in criticism of them, that the Belgians do not work. They have little work of their own they can do, and they will not work for the Germans. That is one of the reasons for the deportations, which have been, by the way, one of the greatest of German blunders — and brutalities — in this war. But I must not write of Belgium now; Headquarters was in Northern France.

It was not all sticking at Headquarters. I traveled — always with my officer, of course — up and down and across and back over all of occupied France; from Lille to Longwy, from Coucy-le-Château to Charleville. For the purposes of our *ravitaillement* the occupied French territory is divided into six districts. These corresponded with no political subdivisions of the country, as *départements* and *arrondissements*, but were determined chiefly by the original disposition of the German armies, each of which, having a certain degree of autonomy as regards the region occupied by it, objected to any movement of French feeding committees and our own American Commission representatives across the borders of its own region. We had therefore six district *ravitaillement* centres, or headquarters, at each of which were stationed one or two of our representatives, who moved about more or less freely in his district, each with a specially detailed German officer of his own — 'nurses,' we called them. It was my privilege and duty as chief representative, and my officer's as chief of the officer group, to visit occasionally each of the districts.

We traveled by military motor, my officer and I in the tonneau, and a soldier chauffeur and an orderly in the driver's seat, each of them with a loaded Mauser held erect in clamps by his side. In each side-flap pocket of the tonneau was a loaded Browning. We were never shot at, nor did we ever shoot at anybody, but the armament gave the proper military tone to our equipage. We ran frightfully fast, and I always had the uneasy feeling that I should find my finish in North France, not in a dramatic erasure by a stray shell or casual bomb from overhead, but in a commonplace motor smash-up. As it came out, the only casualties attending our 5000 or more kilometres of mad running were among the few remaining half-fed chickens of the French villagers. We did once rather narrowly miss being run over by the Crown Prince, who sat on the front seat with an orderly, and drove his own car like a hurricane. As he swerved slightly to miss us, he intrusted his life — and ours — to one of his hands,

while with the other he gave us a débonnaire salute.

This extraordinary touring of North France came finally to get strongly on my nerves. It is such a sad land; such a wreck of half-destroyed villages and crumbled farm-houses; of stripped woodland and neglected fields. And the people: all women and children and old and infirm men! And the meagreness of the food-supply, despite the best we could do! We meant much to these people, we eight or ten Americans moving about among them; at least, they gave us unmistakably to understand that we did. We represented the sympathy and endeavor of a great nation far away. Cut off as these imprisoned French are from all communication with their fighting men across the terrible trench-lines; cut off even from communication with each other, if only a few miles apart, we exemplified the freedom that still existed somewhere, and the hope of the freedom to come to them again. And we meant, too, for them, the holding back of the spectre of actual starvation.

The sights and the incidents of those trips are too harrowing to exploit. They are untellable intimate memories for us, but they went far in making us convinced and bitter believers that the only comprehensible answer to the German philosophy of '*raison d'État*,' and 'military exigency,' to these ravages of non-combatant countryside and village, is an answer of force. Not that we wish to do to them what they have done to others, but to prevent them by force from ever doing that again.

I could understand why the villages along the Meuse were shot to pieces; there was real fighting there — at least in some of them. And there were some more whose names I recalled as associated with the desperate retreating struggles of the overwhelmed French and British. But there are many, many others in which there was no fighting, but just destroying. They have not been enumerated as have the Belgian towns; they have no sad fame in the ears of the world: they are just nameless scores of illustrations and results of the German conception of the struggle for existence as a contributory factor in the evolution of human kind.

There is, I suppose, a slight military advantage in so maltreating and terrifying a conquered land that only a few elderly Landsturmers, scattered here and there over it, are sufficient as an army of occupation. The rest of the Landsturmers can be used in the trenches. But it is a terrible price — of something — to pay for this alleged military advantage.

I used to ask my officer about these wrecked villages as we ran through them, or stopped to inspect a local distributing centre, or watch a soup-line, or get a report, and always a piteous request, from a feeding committee. He had a stereotyped reply: 'Punishment.'

'Punishment for what?'

'For a civilian's shooting at a soldier; or the village's harboring a spy; or a failure to meet a requisition; or something or other.'

He never knew exactly: nobody ever knew exactly; and I do not know exactly. Not even with all the explanation from the captain-professor, who explained it on a basis of biological philosophy. Nor with the explanation of the non-philosophizing fighters, who simply said that it was necessary as a military advantage. Nor with the explanation of my officer, who, when I continued to press him, would make an ugly screwing gesture with closed fist, which seemed to mean, 'Just do it to them!'

I went into Northern France and Belgium to act as a neutral, and I did act as a neutral all the time I was there. If

I learned there anything of military value which could be used against the Germans I shall not reveal it. But I came out no neutral. Also I went in an ardent hater of war and I came out a more ardent one. I have seen that side of the horror and waste and outrage of war which is worse than the side revealed on the battlefield. How I hope for the end of all war!

But I have come out believing that that cannot come until any people which has dedicated itself to the philosophy and practice of war as a means of human advancement is put into a position of impotence to indulge its belief at will. My conviction is that Germany is such a people, and that it can be put into this position only by the result of war itself. It knows no other argument and it will accept no other decision.

HIGH ADVENTURE. I

BY JAMES NORMAN HALL

I

It was a cool, starlit evening, early in September, 1916, that I first met Drew of Massachusetts, and actually began my adventures as a prospective member of the Escadrille Américaine. We had sailed from New York by the same boat, had made our applications for enlistment in the Foreign Legion on the same day, without being aware of each other's existence; and in Paris, while waiting for our papers, we had gone, every evening, for dinner, to the same large and gloomy-looking restaurant in the neighborhood of the Seine.

As for the restaurant, assuredly we were not drawn to it by the quality of the food. We might have dined better and more cheaply elsewhere. But there was an air of vanished splendor, of faded magnificence, about the place, which, in the capital of a warring nation, appealed to both of us. Every evening the tables were laid with spotless linen and shining silver. The wineglasses caught the light from the tarnished chandeliers in little points of color. At the dinner-hour, a half-dozen ancient serving-men silently took their places about the room. There was not a sound to be heard except the occasional far-off honk of a motor or the subdued clatter of dishes from the kitchens. The serving-men, even the tables and the empty chairs, seemed to be listening, to be waiting for the guests who never came. Rarely were there more than a dozen diners-out during the course of an evening. There was something mysterious in these elaborate preparations, and something rather fine about them as well; but one thought, not without a touch of sadness, of the old days when there had been laughter and lights and music, sparkling wines and brilliant talk, and how those merry-makers had gone, many of them, long ago to the wars.

As it happened on this evening, Drew and I were sitting at adjoining tables. Our common citizenship was our intro-

duction, and after five minutes of talk, we learned of our common purpose in coming to France. I suppose that we must have eaten after making this latter discovery. I vaguely remember seeing our old waiter hobbling slowly down a long vista of empty tables on his way to and from the kitchens. But if we thought of our food at all, it must have been in a purely mechanical way.

Drew can talk — by Jove, how the man can talk! — and he has the faculty of throwing the glamour of romance over the most trivial and commonplace adventures. In truth, the difficulty which I am going to have in writing this narrative is largely due to this romantic influence of his. I might have succeeded in writing a plain tale, for I have kept my diary faithfully, from day to day, and can set down our adventures, such as they are, pretty much as they occurred. But Drew has bewitched me. He does not realize it, but he is a weaver of spells, and I am so deeply enmeshed in his moonshine that I doubt if I shall be able to write of our experiences as they must appear to those of our comrades in the Franco-American Corps who remember them only through the medium of the revealing light of day.

Not one of these men, I am sure, would confess to so strange an immediate cause for joining the aviation service as that related to me by Drew, as we sat over our coffee and cigarettes, on the evening of our first meeting. He had come to France, he said, with the intention of joining the *Légion Étrangère* as an infantryman. But he changed his mind, a few days after his arrival in Paris, upon meeting Jackson of the American Aviation Squadron, who was on leave after a service of six months at the front. It was all because of the manner in which Jackson looked at a Turkish rug. He told him of his adventures in the most matter-of-fact way. No heroics, nothing of that sort. He had not a glimmer of imagination, he said. But he had a way of looking at the floor which was 'irresistible,' which 'fascinated him with the sense of height.' He saw towns, villages, a network of trenches, columns of toy troops moving up ribbons of road — all in the patterns of a Turkish rug. And the next day, he was at the headquarters of the Franco-American Corps, in the Champs Élysées, making application for membership.

Now it is strange that we should both have come to France with so little of accurate knowledge of the corps, of the possibilities for enlistment, and of the nature of the requirements for the service. Our knowledge of it, up to the time of sailing, had been confined to a few brief, scattered references in the press. It was perhaps necessary that its existence should not be officially recognized in America, or its furtherance encouraged. But it seemed to us at that time that there must have been actual discouragement on the part of the government at Washington. However that may be, we wondered if others had followed clues so vague or a call so dimly heard.

This led to a discussion of our individual aptitudes for the service, and we made many comforting discoveries about each other. It is permissible to reveal them now that we are at the point of becoming breveted *pilotes*, for the encouragement of others who, like ourselves at that time, may be conscious of deficiencies, and who may think that they have none of the qualities essential to the successful aviator. Drew had never been farther from th ground than the top of the Woolworth building. I had once taken a trip in a captive balloon. Drew knew nothing of motors, and had no more knowledge of mechanics than would enable him to wind a watch without breaking the

DISCUSSION AND CORRESPONDENCE

BIRTHS AND DEATHS IN THE CIVIL POPULATION OF FRANCE IN THE WAR-TIME

To the Editor of Science: In the current number of Science (September 12) just received there are published the figures from the "Journal Officiel" of the birth and deaths for 1913, 1914, 1915, 1916 and 1917 in the French departments not included in the zone of occupation and military occupations. These show a terrible increase of deaths over births. To give the whole picture of the serious effects of the war on the French civil population the figures are needed for the occupied territory. I can provide a few as a result of opportunities offered while at work in occupied France for the Commission for Relief in Belgium and North France.

In Lille, by far the largest city in occupied France, there was in the two years 1915 and 1916 a 47 per cent. decrease in births and a 45 per cent. increase in deaths as compared with pre-war ratios. This determination takes into account the difference in population of the city between the pre-war and the war years produced by an escape of one fourth of the city's inhabitants before the German forces occupied it, but it does not take into account the fact that this diminution of population was not effected by a simple random selection among the whole population (*i. e.*, by a proportionate lessening of all age groups and both sexes) but resulted largely from the removal for military service of almost all physically fit men of the age-group twenty to forty-five years. Part of the diminution also was caused by the emigration at the time of the invasion of entire families of the well-to-do class able to afford the expense of removal. This last group may perhaps be taken to be, on the whole, a particularly healthy group. In making, therefore, direct comparison of the mortality ratios for the two periods (war and pre-war) these special facts should be taken into account.

The increased percentage of deaths occurred especially in the age-groups 1 to 19 years, where it was 81 per cent. more in 1915–1916 than in 1913–1914, and 60 years and over, where it was 85 per cent. The principal immediate causes of the increased deaths were tuberculosis, brain hemorrhages and heart affections. The ultimate causes were of course certain war-produced conditions, especially the insufficient amount and variety of food and the necessity for a renewed return to hard work in the fields by old men and women to make up for the absence of the able-bodied men.

Data with regard to Charleville, another French city in the occupied territory, but one in an agricultural rather than an industrial region—Lille is the center of North France's principal industrial region—show almost identical conditions. And I believe from my personal observations during 1915 and 1916 over the whole of the occupied territory that the death-ratios in these two cities are a fair sample of those for the whole of the occupied region. The occupation extended, of course, for a much longer period than merely 1915 and 1916. It extended from late in 1914 until late in 1918. Undoubtedly these ratios of lessened birth-rate and increased death-rate in the occupied territory of France for 1915–1916 are not greater, but probably because of the increase of exhaustion and difficulties with food, fuel, clothing, medical service and supplies, less than those for 1917 and 1918.

Vernon Kellogg
National Research Council,
Washington

INSTINCTIVE BEHAVIOR IN THE WHITE RAT

In confirmation of Mr. Griffith's observation of a possible case of instinctive behavior in the white rat reported in Science for August 15, 1919, I wish to add a somewhat similar observation which I made a few months ago.

Upon placing a few handfuls of fresh dandelions into a cage of some twenty white rats of various ages which had been reared in the laboratory for several generations, much to my surprise I found the rats at once ran away from the greens and gathered in one corner of the cage and behaved in a thoroughly frightened manner. At first I could not account for this strange behavior, for hitherto the rats had fed with avidity on fresh dandelions and seized the plants as soon as they were placed in reach. On further thought, I recalled that I had gathered the dandelions on this occasion in an old basket which had recently been used for bringing a

live cat into the laboratory and which had probably imparted an odor of cat to the greens.

I did not watch the rats very persistently, but the next day I noted that their behavior was perfectly normal and that the greens had been entirely eaten. It may be said with certainty that these animals which were so terrified had never in their experience been near a cat.

At the same time that I was working with white rats I had to use some rabbits and had occasion to handle some rats immediately after handling the rabbits. The rats did not respond in any peculiar way in the presence of the odor of rabbits, and as this was just as strange an odor as that of cat, it can hardly be assumed that this reaction of fear in the presence of the odor of cat was due simply to the novelty of the stimulus.

B. W. Kunkel

Lafayette College

AN EARLIER SNOW EFFECT

To the Editor of Science: In your issue of August 29, Professor Woodman, University of Maine, describes an unusual snow phenomenon, and he states that it would be interesting to know if others have observed anything like it in other localities. It may therefore be worth while to call attention to a similar phenomenon described by Thoreau in his "Journal," Vol. XIII., pages 24–26:

I see, in the Pleasant Meadow field near the pond, some little masses of snow, such as I noticed yesterday in the open land by the railroad causeway at the Cut. I could not account for them then, for I did not go to them, but thought they might be the remainders of drifts which had been blown away, leaving little perpendicular masses six inches or a foot higher than the surrounding snow in the midst of the fields. Now I detect the cause. These (which I see to-day) are the remains of snowballs which the wind of yesterday rolled up in the moist snow. The morning was mild, and the snow accordingly soft and moist yet light, but in the middle of the day a strong northwest wind arose, and before night it became quite hard to bear.

These masses which I examined in the Pleasant Meadow field were generally six or eight inches high—though they must have wasted and settled considerably—and a little longer than high, presenting a more or less fluted appearance externally. They were hollow cylinders about two inches in diameter within, like muffs. Here were a dozen within two rods square, and I saw them in three or four localities miles apart, in almost any place exposed to the sweep of the northwest wind. There was plainly to be seen the furrow in the snow produced when they were rolled up, in the form of a very narrow pyramid, commencing perhaps two inches wide, and in the course of ten feet (sometimes of four or five only) becoming six or eight inches wide, when the mass was too heavy to be moved further. The snow had thus been rolled up even, like a carpet. This occurred on perfectly level ground and also where the ground rose gently to the southeast. The ground was not laid bare. That wind must have rolled up masses thus till they were a foot in diameter. It is certain, then, that a sudden strong wind when the snow is moist but light (it had fallen the afternoon previous) will catch and roll it up as a boy rolls up his ball. These white balls are seen far off over the hills.

This description is accompanied by a drawing, so characteristic of Thoreau, showing the cylindrical ball and its path in the snow.

Benjamin Franklin Yanney

The College of Wooster,

Wooster, O.

QUOTATIONS

THE ARMY AND SCIENCE

The university has not yet been accustomed to think of the army as an institution in which scholarship flourishes. Nor has the army been interested in the work of the university. Each went its way in the belief that its task was so different from the other that the benefit to be derived from cooperation would be outweighed by the trouble involved. That this attitude has been completely changed is due more to the changes in fighting than to those in teaching. It was only a short while ago that such an expression as "the science of war" flattered the activity of generals and their armies. The infantry had to know how to shoot and the cavalry how to ride. Tactical problems, solved by the General Staff, consisted largely in the accurate reading of maps and the direction of marches

The Deserter from the *Brutus*

A Story of Patriotism

By Max Vernon

AS WILKINS stepped over the edge of the *Brutus* on the coal-grimed government wharf at Pago-Pago, he changed suddenly from a rage-maddened tiger to a cautious and furtive weasel. He glanced, apparently casually, really most keenly, at the half-naked brown Tongan roustabouts, eating and smoking in little groups on the wharf. It was the noon-hour. And then he walked slowly and idly across the wooden floor and on around the end of the great coal-sheds.

As he walked he rolled a brown paper cigaret, pouring out with steady hand the cheap flake tobacco from its little cloth bag. He looked curiously at his firm hands as his fingers manipulated the tiny roll of paper, and wondered a bit at their capacity for this present trivial performance. For it had required both hands to hold, and both great hairy arms to lift above his head, the jagged mass of coal which he had just crashed down into the face of Second Engineer Bender.

As he passed the coal-sheds he did not turn to the right along the beach, where were ranged the native toadstool houses and the few scattered gleaming white government buildings that made up the little port village of Pago-Pago. Wilkins must needs forego the usual noonday pleasure of a brief social hour with the lazy, friendly, chattering, brown men and women of the beach. So, with final glances to right and left and behind, he buried himself at a plunge in a narrow tunnel-like path in the tropic bush.

For the aggressive velvet green jungle of the Tutuila mountains and hills comes down to the very skirts of Pago-Pago village, and would flow indeed quite over the flounces of these skirts were it not intermittently beaten back with ax and fire.

The bush path into which Wilkins had disappeared—and without the path he could not have penetrated the lush liana-bound jungle at all—was a special one recently hewn out by the sailors of the *Wheeling*, the trim white gunboat at the station.

It led from the government wharf and store-sheds up to the swift little hill which lifted directly above them, on the summit of which a tall white flagpole bore aloft all day the red-white-and-blue symbol of American sovereignty. Each morning a sailor climbed the path with the precious cloth under his arm, and with him a bugler, who blew triumphantly as the flag ran gracefully apeak, while all the sailors ashore or on the gunboat in the harbor, and all the government officers and clerks—all, indeed, there was of governing America in Pago-Pago—stood at rigid attention, faced to the little green hill.

And at sunset, the marvelous swift tropic sunset, the path was climbed again by sailor and bugler, and again the world stood still and at attention as the flag slowly fell and the bugle called its clear notes. This flag-raising and flag-falling were—what shall I say?—two patriotic hymns, two public Fourth of July orations, two "Home, Sweet Home" songs a day, in this distant, isolated speck of America, this emerald satellite of the mother planet, awash in the great, warm, blue, tropic Pacific.

Wilkins bore no flag as he trudged along the path. It was already up there above him, speaking out in staccato little pops and jerks its message of freedom and friendliness.

But Wilkins interpreted the flag's talking all wrong. To him it cried out harsh oaths and sneering jeers, and orders of days in brig on bread and water, and threats of irons and tricings-up. Wilkins had been taught to translate the flag language by Second Engineer Bender, and the grammar and vocabulary he had learned were equally atrocious. From Baltimore to Pago-Pago, round the Horn, is a long, long voyage, and more especially when one is a stoker in the oven-like depth of a heavy iron government collier like the *Brutus*. But most especially of all when the one man who is the flag and government to you, and slave-owner and overseer of you, all in one, is a brute.

At the top of the hill, under the monologing flag, Wilkins stopped for breath. It is curiously breath-taking and warm and perspiring work to climb a steep hill under the ardent tropic sun of Tutuila. And Wilkins, though clad only in sleeveless undershirt and thin overalls, and used to working mightily in a bake-oven, was not inured to the glaring light and the beating sun on his bare head. Also he had just been enraged enough to kill a man. And this, too, is heating.

SO WILKINS'S head was painfully hot, and at his temples and also low in the back of his brain, were heavy audible throbbings—much like the engine-throbbing of the *Brutus*. Perhaps if Bender were not yet dead he was feeling throbbings too. Everything seemed throbbing. Even the blinding noonday light came and went in telegraphic flashes. Wilkins realized that for a man trying to run for his life he was perilously near to fatal weakness. He leaned against the flagpole. He wrapped his arms about it. He closed his eyes to the dot-and-dash flashes of light.

The flag hanging over him in the listless wind cast down on him, though he didn't know it, an uncertain shade. Wilkins muttered, "God, let me be strong; let me get away. It was his fault; he treated me like a dog; the others were cowards; they are not Americans." Now this was not a prayer; it was simply Wilkins muttering semi-deliriously to himself.

But some way—perhaps it was the uncertain protecting shade of the great flag—the throb died down. Wilkins did not faint, but opened his eyes, and felt cooler, and stronger and saner.

It was a marvel of quieting peace-begetting beauty, this scene that Wilkins opened his eyes upon as he still clung to the supporting flagpole. From the right there came to him the low tones of the surf breaking unceasingly on the coral reef near the harbor mouth; and slowly turning that way, he saw the even, distance-softened curving white line that marked the outer margin of the fringing reef. Beyond stretched the utterly blue sheet of the Pacific, lifting its distance horizon-high up into a cloudless sky.

At the water's edge, all around the crater harbor below him, ran the narrow strip of gleaming beach, while back a few paces from it peeped out the scattered Samoan huts and rose the gently curving slender poles of coconut palms and the dense dark-green heads of the great-leaved breadfruit trees. And among them all, like slow ants, moved the natives, with naked, shining oiled shoulders and lava-lava clothed loins.

AND then Wilkins's bloodshot eyes roved out over the curious lake-like harbor, where rode the station gunboat like a great white-bodied albatross, tossing idly on the smooth swell. Not far from it rested the black bulk of the *Brutus*, tied up to the government wharf. It was here to vomit out its heap of coal so that this exquisite islet gem should be something practically useful for the gray ships of war that might come here some day bellowing for more fuel to feed their fires of rage.

And as Wilkins's eyes rested on the grimy collier, the growing peace and quiet in his breast disappeared. For with sudden vision that pierced the iron walls of the ship and penetrated deep into its dark hold, he saw the mangled red-and-white face of Bender, and his huddled form lying ugly on the tumbled coal. And with panic in his heart, Stoker Wilkins turned to the bush, frantic to flee.

As wildly as the driven rabbit dashes for the open, so wildly this panic-ridden man dashed for the close. He lunged against the odorous green wall in front of him. It gave—happy marvel. He plunged through; he stumbled along; he found always an invitation in a sort of scanter growth that seemed to follow a twisting line around the hillside. Wilkins had stumbled into a disused path, already reclaimed in part by the grasping jungle, but not yet wholly regained. His thin undershirt distributed itself in bits to the clutching branches; his hairy chest bled in slow drops from the raw places; his hair and beard caught strange hooked seeds, and his grimy overalls gaped wide at the many rents. All but naked he struggled along this gantlet line of scourging plant things, fighting for life. It

I never even heard it myself. Neither did Joel P. Winton. When I ventured to look, he was still sitting on the extreme edge of his seat, primed, so to speak, but totally unexploded. Whatever he was going to say to that young lady remained within him and unsaid, and as I looked he gradually began to turn the color of old limburger cheese that has been out in the sun several days. There was a thunder of laughter and the shrieks of many innocent people enjoying themselves, but we were not among them. Wherever I looked, I could see nothing except the Ferguson ranch being sold to strangers.

"Let's get out," Joel said in a hoarse whisper.

I said nothing, but followed him, and a moment later we were standing in the dreary Arizona sunshine looking at each other like a couple of lost souls on the last day. There was nothing to be seen of the lady. She had vanished, along with my ranch and my slightly used automobile. Joel smiled in a sickly sort of way.

"Well, Andy," he said, "we slipped up on that one, didn't we? Now what'll we do?"

"Let's go down to the morgue," I said, "and see if we know anybody."

In more or less silence we drifted back to our garage, wondering why Miss Pearson had walked out on us at the psychological instant.

"Why couldn't she have waited ten minutes?" I demanded morosely.

"And what did that usher say to her?" Joel inquired. I didn't know the answer that day, but I did the next.

About ten o'clock Sunday morning I sat on the stoop behind the bunk-house trying to forget my woes and put an edge on a favorite razor. Joel had been very gloomy after leaving Phœnix. He came around the end of the building, carrying the morning paper.

"She's gone," he said, "and now I know why she left the theatre."

"Why?"

He stuck his finger at the first column and handed the paper to me, and this is what I read:

Mr. Alonzo Pearson, the Saginaw chair manufacturer, at a late hour last night was declared out of danger, and the Pearson family will start for Michigan this morning in their private car Cyclops. Mr. Pearson narrowly escaped death, according to the statement of Doctors Ruth and James, who attended him. Yesterday afternoon the manufacturer, who is elderly, encountered a humorous stranger on Hill Street near Finegan's drug-store. The stranger told Pearson a number of funny stories and one joke in particular, at which the wealthy old gentleman laughed most heartily.

He continued to laugh all the way home, and finally his merriment brought on an attack of hiccups, which gradually became more violent. He grew rapidly worse and our two best doctors were summoned, by which time the old gentleman was very weak and his life was despaired of. His alarmed wife and children gathered round his bedside. A messenger was sent post-haste to the Olympic Theatre, where Miss Doris Pearson was attending a matinée, and——

At this point, I ceased to read and began to look at a cloud of blue spots in the air.

"It must have been a mighty funny joke," Joel said sadly.

"It was," I admitted, unable to keep the horrible truth locked in my guilty bosom. "It was that one about the Scotchman and the guineapig."

Joel looked down at me in utter bewilderment.

"How do you know?" he asked.

"I told him," I said feebly. "I'm the humorous stranger he met on Hill Street."

"*You* told him," Joe yelled.

Then he began to laugh. If he had walloped me on the jaw, I would have felt better about it. He walked away, still laughing like a demented person, and when I saw him again he was hurling his belongings into the slightly used automobile with the tan slip-covers. That morning he departed from our ranch, saying good-by to nobody and not a word about the Ferguson ranch.

Since then I've been looking peaked.

"Andy," the boss said recently, "you ought to see a doctor."

"A doctor is no use," I replied sadly. "I need a surgeon."

"What for?" he asked, astonished.

"To cut out my luck," I said. "Lately my luck has been terrible."

And that's the way things stand.

November

By Theodosia Garrison

NOVEMBER is a spinster who never had a lover,
All her pretty sisters have sweethearts by the score,—
Wistful April, singing June with roses wreathed above her,
And the gipsy girl October flaming out from brake and cover;
But a gaunt, gray spinster is November evermore.

Brown earth beneath her feet, dull skies above her,
Not a flower anywhere nor any wings to start,
November is a spinster who never had a lover,
But when you see her sunsets you look into her heart.

I have loved her sisters, I have praised their graces,
But in grim November I find a better thing,—
A grief that asks no comforting, a heart that seeks no praises;—
I'd rather have her courage than all their pretty faces,
Her honest, blunt assurance than the promises of spring.

Brown earth beneath her feet, bare boughs above her,
Walking through the empty fields silent and apart,—
November is a spinster who never had a lover,
And only through her sunsets you look into her heart.

He never got over his first turn to attention when the bugle called.

was the madness of panic, that madness that comes to the child in the dark or to men in burning buildings.

How long in rods or in time that panic flight lasted, Wilkins knew not. Was it a lifetime of mad fear and struggle, or was it but a few minutes or seconds of superhuman feeling and effort? How much of the possibilities of the human capacity to feel and strive may be exhausted in the drowning man's visions and clutchings, or the torture pains and gyrations of the gasping rogue at the end of the noose? How much, no credible witness has ever come back to tell us. But Wilkins came back. And yet he would not, perhaps could not, tell, as we talked together on a later day.

The end of Wilkins's death-struggle was life. He burst out of the torturing bush into a sun-lighted little clearing where an old man and a girl-child were digging up taro tubers. Or rather, when one looked a bit closer, Fa'uli was not a girl-child; she was a woman-child. Very young do the slender child-faced Samoan girls become women.

With the plunging advent of Wilkins, taro-gathering was for the moment perforce suspended. But beyond a first slight start, neither old man nor girl betrayed any considerable surprise at this unheralded fleshly manifestation. On Wilkins's part the utter peacefulness and quiet and seclusion of the scene acted like a fairy charm. Panting, bleeding, with bloodshot, wild eyes, cruelly torn hair and beard, and even more nearly mother-naked than the lava-lava clad natives themselves, he regained, almost in a breath, all his understanding and self-control. For, some way, the little glade, the quietness, the soft-eyed, friendly-gazing Fa'uli, and the placid, bent old man, spelled safety and peace to Wilkins. And when the girl came slowly up to him, calmly drawing her scanty covering together over shoulders and breasts, and said sweetly, "*Talofa!* Where you come?" he straightened up, unashamed and unafraid, responded, "*Talofa,*" and simply pointed toward the harbor.

"Ah, you shippie man?"

"Yes, I was ship man but now no more."

"You serta?"

"Yes."

"Bad man he come?"

He slowly turned and looked toward the flapping flag and said, "Probably, yes."

"You my flen?"

"Yes."

SHE smiled softly and stretched out her slender brown arm toward him. He took her cool hand and she led him to the old man who stood leaning on his rough mattock. Him she talked to swiftly in a few liquid phrases, and then turning to Wilkins said: "We go home better before bad man he come."

The old man lifted his woven pandanus basket of taro tubers, and with a single glance at Wilkins and a simple "*Talofa,*" shouldered his mattock and led the way to a narrow opening in the bush. Fa'uli and the deserter Wilkins followed, hand-in-hand.

Brown, sturdy, large-eyed, liquid-spoken, care-free, hospitable and loving were the "flens" and comforters, brothers and sisters and fathers and mothers, that the ecstatic Wilkins discovered in the little Samoan village nestling in the bush not two rifle shots from the coal-grimed *Brutus*. If there was a touch of calculating in the shaving and staining, the substitution of a lava-lava for remnants of shirt and overalls, if all the manipulating which made Wilkins something of a handsome man and a good deal of a Samoan, if it had a bit of thoughtfulness about it, it seemed more the result of the merry doing of "flens" and brothers to fool "bad shippie man he come" than to any calculating on the part of Wilkins.

From coal-heaving on the *Brutus* to perennial resting on a tropic isle! And with Fa'uli for "flen." No village *taupo* was ever lovelier than Fa'uli; none ever with more rounded, gleaming shoulders, odorous with shining oil of copra. No happier, wholesomer, nor more hospitable family than hers, sitting day long a-squat on the sleeping-mats under the toadstool roof, the women weaving at fine mats, or pounding and staining the wood-pulp tapa clothes; the men earnestly watching them, or chatting together, as they smoked their long, tapering, pencil-like cigarets. And enveloping them all the soft languor of the

changeless tropic day; gleaming about them the glowing light of the ardent tropic sun.

So, merged securely in the household of Fa'uli, Wilkins basked free and unmolested in the light of the tropic sun, and of the only less ardent eyes of his keen-witted, soft-spoken, little "flen." He lolled at pleasure on the sleeping-mats in the house; he went into the bush with the old man by hidden paths to collect a few coconuts or bread-fruits; he wrung an occasional chicken's neck; even, secure in his new brown oiled skin and shaven face, he helped the laughing men and women draw the great village seine in a sheltered cove at the harbor's end. As the time passed unnoted by, life for Wilkins was one long, warm drowsiness and daze of joy.

WE MAY not believe that the officers of the *Brutus* and the red-sashed *fita-fitas* of the commandant's body-guard did not search for Wilkins. On a little island, five by ten miles, most of it covered by impenetrable bush, it should not be difficult to find a roaming white man clad in tatters of shirt and overalls and crowned with a rough shock of yellow hair. But perhaps the apparent certainty of the quarry made the search less persistent and careful. Or perhaps the ingenuity and resources of the little "flen" Fa'uli overmatched the keenness of the hunters. As far as the seekers from the *Brutus* were concerned, Stoker Wilkins, deserter, was certainly unrecognizable as that child of nature, Fa'uli's "flen Williking," stalking carelessly about in a village not even out of sight of the flapping flag on the hill-top. And as for the *fita-fitas*, the native constabulary, were they not almost every man of them, brother, cousin, uncle or what-not to Fa'uli or some members of her toadstool-hut family?

It is in the nature of some men when such relief from work and stress comes as came to Wilkins, to drift into a settled incapacity for any future striving. Of such men is composed the human flotsam and jetsam strewn along the beach of every little sun-kissed coral inlet in the Pacific.

But there is another kind of man who gets rested sufficiently; who rests out, so to say, and is pricked by something in him toward lifting up life's burden again. Unfortunately for "flen Williking's" peace mind, he was of this latter sort of man. A steady course of sweet doing-nothing interrupted irregularly by monotonously similar repasts of coconut milk, roasted breadfruits and taro, cuttlefish arms and large white beetle-grubs, began, insidiously, to stir up in Wilkins's inside a certain *malaise*. There came, too, occasional twitchings in the great muscles of the arms and thighs that seemed to be complainings at their neglect.

And the few specimens of white children of nature inscrutably known as beach-combers, that Wilkins saw now and then in the village or elsewhere, were not pleasant companions, nor even cheerful sights to contemplate from little distances. One wreck in particular was an extremely unsettling sight to Wilkins. His eyelids moved unnecessarily and non-synchronously; there was a lack of teeth and a prematureness of grayness in the hair and wrinkles on the face that boded ill for the future.

But perhaps what most disturbed the peace of Wilkins's mind and soul was the morning and evening flag ceremony. Through the quiet distance he would hear the bugle faintly but clearly every morning and evening, and his eyes all unconsciously rarely missed the fluttering of the rising and falling flag. He never got over his first turn to attention that had been his wont when the bugle called. And some days he would stand absently gazing at the distant little green hill by the harbor's mouth, with the flag streaming out in the fresh trade-wind.

"Ah, bad shippie man where flag is," would murmur sympathetic little Fa'uli. And Wilkins would start and turn to her, and drop his heavy hands on her smooth shoulders and say, "Yes, bad men there." But his great arms would twitch and there would come to him a swift restiveness. He would recall the hoarse shouts and oaths of his working companions; and there would come the memory of the reluctant murmur of admiration his giant strength had wrung from the rough Titans about him.

He would suddenly reach out and roughly grasp and swing the half-frightened Fa'uli aloft, as if her plump little body were a feather's weight. And she feared these occasional moments in her "flen Williking!" Could he be going to become "bad head" like the old white man Anderson, who used to drink so much gin and stagger out of his trading-house ready to maim and kill? He had been carried away finally by the commandant's *fita-fitas*, howling wildly, and slavering horribly at the mouth. And she would shrink a little as Wilkins put her lightly on her feet, and would stroke his hand timidly until he turned his face and smiled at her again.

But if little Fa'uli had her misgivings and fears, what had she to make of complaint and protest? Into her care-free life had come this wonderful new thing, and, thankful and happy and proud, she accepted her gift from the gods. But this splendid gift would continue to belong to her, she knew, only as they willed it. Constant and ever-loving, hand in hand and by his side, Fa'uli clung to her flen. Trembling a little now and then with strange, half-realized emotions, but stoic in her happiness and in her possible woe alike.

She knew a little of the ways of the white man of the beach, and that little was not reassuring. But this great, strong, simple giant, mostly smiling, always gentle, was different from the men she had seen or the men of the tales told among the chattering villagers.

AND so drifted on the uncounted days. Always the glowing sun and the swift little showers from the tiny clouds; the murmuring and chatting and singing in the house; the laughing and loving about the evening cook-fire; the feasting and kava-drinkings; the strolls under the strange star patterns of the southern sky.

But one time there came a bad evening for Wilkins. A little party of white men, officers on a visiting British gunboat just arrived, came after supper to the village to see a *siva-siva*, or native sitting dance, arranged by the commandant as an entertainment for them. Wilkins, in passing near the group, heard but a single sentence before he turned sharply away at the sound of the English words. The sentence was: "Yes, the *Brutus* is going out in a couple of days; they almost finished unloading to-day." Just then the soft, distant bugling for the sunset flag-fall came. And as one of the British officers turned toward the falling flag on the little green hill, he stared surprisedly at a tall, unusual looking native momentarily who had come awkwardly to attention, with hand brought to bare head in salute.

"Did you see that curious chap there?" he asked a companion, as Wilkins pulled himself together quickly and walked swiftly away.

The next day at officers' mess on his boat, where the commander of the *Brutus* was dining on invitation, he told of the incident over the coffee. The impassive-faced commander was perhaps the only one at table who did not hazard a guess as to the unusual behavior of the native, but the next day he called on the commandant, and the captain of the *fita-fitas* received a special order.

When deserter Wilkins strode away with the single English-spoken sentence clamoring in his ears, he did not go to Fa'uli's house, but took a twisting path that led down through the bush to the water's edge at the upper end of the harbor. Here he clambered on a green lava rock and sat gripping at his knees, gazing straight down the crater harbor to where the mast-lights of the two gunboats and the *Brutus* sparkled like suspended fire-flies over the still water. And Wilkins thought and fought. He struggled with instinct and heredity and association and training. He struggled with loyalty to his new-found, trusting little companion. He fought for his life—for death awaited him there at the hands of his blood-kin, and soft, indolent, easeful, loveful life was here with his simple companions of the tropic bush. But he fought simply and unsophistically, with nature and nurture against him. He could sit no longer; he tramped the beach sands; he roamed the path-cut jungles; but ever deserter Wilkins, a man of no sophistry, fought his too complex fight.

FA'ULI waited long awake in the toadstool house. A few other times "Williking" had remained away in the bush or on the beach for a whole, soft, tropic night, and so Fa'uli was not too disturbed this time. Once, far in the night, her restless arms seemed to touch a body, and a swift kiss seemed to hover on her lips. But she drowsed on unawakened.

As the sun rose swiftly—a great golden ball fairly leaping from its sparkling couch on the eastern waters—the flag began its graceful ascent of the tall white pole on the little green hill, and the bugle called its first clear tones. But before the flag unfurled or the bugle song ended there came racing down the beach and up to the government wharf a strange-looking man, huge and hairy, mostly brown, torn by the thorn-teeth of the jungle. And as the flag blew out gloriously to the freshening breeze, and the lilting echoes of the bugle came dying home, Wilkins halted and drew himself up awkwardly, but rigidly, to attention, face to the little green hill.

but looks so lonely and humble that I have to walk round the garden to comfort him each time. It makes gardening an extra-special long process!

This morning, while I was working, there was a rustling in the syringa bush, but no visible cause. Of course, I raised my voice and called, 'Wriggles, get out of the garden!' I then saw Dan'l emerge quietly, and furtively sneak off, pretending he was Wriggles, and never looking back at all!

Once Julie said to me, with a touch of disapproving asperity, 'Of course, *I* can't feel as you do about dogs. *I* love babies.'

At the time I was amused, but also a little annoyed, and said, 'Well, one can love both.' But she really was justified, because puppies have a special significance for me, and I'm afraid babies have not — certainly not until they become personalities.

I went to the Bull-dog Club show one spring, and saw there a most enchanting young thing, a few months old. He was extraordinarily well developed in bull-dog characteristics, and I was quite wild about him; but of course he was unobtainable. The next February, at the Westminster Kennel Club show, I saw my friend and recognized him instantly. I turned to the catalogue and verified the recognition, or else I would not dare to tell the tale, even to dog-lovers, for bull-dogs are generally very different in puppyhood and young-doghood. However, there he was, and Blackberry was his name, if I remember correctly. How many babies would have that much individuality in the first few months of their existence?

The mere sight of a dog creates a special intensity of living for the moment. All your senses have memories, which wake and concentrate as you look at him. You know how each kind of dog feels under your hand, the texture of his coat, the silky places behind his ears, even if he is the roughest of Airedales, the wet, cool tip of his nose, the firm roundness and ripple of muscle in a terrier's haunch, the sinewy hollows in his leg, the delicious earthy smell of the paws, the flowing finished lines of a thoroughbred English setter, and the ineffable look of meekness that crowns his head — all these are sensations of a delicious intensity to the dog-lover.

I think I could be pretty nearly happy if I could spend all my time with them and have a piano and books thrown in.

Sunday. I am just back from a lovely walk up the valley, I took a slice of bread and butter and a tomato and a piece of gingerbread, and started off to Newfane; but when I was in the middle of that hill on the sharp curve this side of Newfane, I saw that there was a river road; so I turned back and followed it up the river, until I seemed so far from civilization that I became a little frightened. So then I climbed down the bank to the river's edge, and ate my lunch. I threw the stem-end of my tomato into the water, and Wriggles was *most* anxious to eat it. He followed it as it floated along, and every once in a while would bite at it! Of course, it would sink a little and he would get a mouthful of water instead! He was so persistent and plucky about it that I finally fished it out and gave it to him! He then sat beside me on a rock, and would occasionally reach out and paw the water a little — the reflections in it interested him deeply. What must they think of things that have such a visual reality, and vanish at a touch?

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THE BIOLOGIST SPEAKS OF DEATH

BY VERNON KELLOGG

I

I TRIED during the war to tell the American people — so far, at least, as they might be reached through the *Atlantic Monthly* — something of the nature of the German arguments from biology why there must always be war, why there ought to be war, and even why Germany should win in the war then being waged. For I believed that Americans should know something of this feeling and attitude of the German people, or of a considerable, and certainly very influential, part of them. I do not wish to repeat too much of what I have already presented in Atlantic articles. But we need, for the purposes of our present discussion, to recall the essential features of this claim; for this argument from biology of the inevitableness, and even the desirability, of war has been used, and is used to-day, by others than Germans. Indeed, if the German people to-day admit the argument with all of its implications, the result of the war should be accepted by them as a revelation and proof of their evolutionary biological unfitness in comparison with nearly a score of other peoples; and the Germans should not care to recall the argument. But I have heard of no statement from German sources to this effect.

The argument to which I have referred is based on the assumption that natural selection is the all-powerful factor, almost the sole really important factor, in organic evolution. And that, as man as an animal species is subject to the control of the same major evolutionary factors which control the other animal kinds, his evolutionary progress, or fate, is to be decided on the basis of a rigid, relentless natural selection. It is the argument from a post-Darwinian point of view, of which Weismann, an eminent German biologist, was chief exponent, and which goes much beyond Darwin's own conceptions.

Natural selection itself, as you know, is the outcome of a bitter and persistent struggle for existence, in which struggle the fittest, or fitter, survive, while the less fit become either much modified or extinguished. This struggle has three chief phases.

1. An inter-species struggle, or the lethal competition among different animal kinds for food, space, and opportunity to increase.

2. An intra-species struggle, or lethal competition among the individuals of a single species, resultant on the overproduction of individuals due to natural multiplication by geometric progression. And

3. The constant struggle of individuals and species against the rigors of climate and the danger of storm, flood, drought, cold, and heat.

Now any animal kind and its individuals may be continually exposed to all these phases of the struggle for existence, or, on the other hand, any one or more of these phases may be largely ameliorated, or even abolished, for a given species and its individuals. This

amelioration may come about through a happy accident of time or place, or because of the adoption by the species of a habit or mode of life that continually protects it from a certain phase of the struggle.

For example, the adoption by two widely distinct, and perhaps originally antagonistic, species of a commensal or symbiotic life, based on the mutual-aid principle, — thousands of such cases are familiar to naturalists, — would ameliorate or abolish the inter-specific struggle between these two species. Even more effective in the modification of the influence due to a bitter struggle for existence, is the adoption by a species of a social or communistic mode of existence, so far as its own individuals are concerned.

As a matter of fact, this reliance by animal kinds, for success in the world, upon a more or less extreme adoption of the mutual-aid principle, as contrasted with the mutual-fight principle, is much more widely spread among the lower animals than is familiarly recognized; while in the case of man, it has been, in connection with high brain-development and the acquirement of the power of speaking and writing, the greatest single factor in the achievement of his proud biological position as king of living creatures.

Altruism — or mutual aid, as the biologists prefer to call it, to escape the implication of assuming too much consciousness in it — is just as truly a fundamental biologic factor of evolution as is the cruel, strictly self-regarding, exterminating kind of struggle for existence with which the Neo-Darwinists try to fill our eyes and ears, to the exclusion of the recognition of all other factors.

This mutual aid, as a biologic or natural factor, has influenced materially, as I have said, the mode of life, the biologic success, and the character of the evolution of many kinds of lower animals. In their case, it was not, we presume, consciously chosen or consciously developed. In the case of man, however, where also mutual aid has been a fundamental factor in determining the mode of life and the success and character of the evolution of the species, and where in the beginning also it may have been entirely unconsciously taken on, we face an important new thing in relation to it: that is, its conscious development. Indeed, it is the high development of mutual aid, plus a high degree of brain-power, plus the existence of something we call spirit or soul in man, all of these interacting on each other to the advantage of the further development of each, that really distinguishes man from other animals, and makes him human. This conscious development of mutual aid, or altruism, by man demands some further consideration of the problem of war as the biologist faces it.

Man differs markedly from other animal species in having two kinds of inheritance, often confused because of the use of the common term, inheritance, for both kinds. He has a biological inheritance — this is real heredity, inherent in him, and responsible for much of his physical and mental condition, and for that reflex and instinctive behavior, partly indispensable for the actual maintenance of his life and health, but partly no longer indispensable, in his present stage of evolution, as in the cases of various brute performances once necessary to his self-preservation.

He has also a social inheritance, not a part of his heredity, but playing a very important and conspicuous rôle in his life, especially in his less material, his higher life, as we are accustomed to call it — the part of his life that especially characterizes him, and makes especially worth while being human. Man is not born with this social inheritance in him,

as his biological inheritance is in him, but with it all about him, ready for him and certain to be, in some measure, imposed on him. He is born into it rather than with it in him.

This social inheritance consists of tradition, of recorded history, of precept and example — of education, in a word. It is possible because of mutual aid, and speech, writing, and printing. Other animals, especially a few of the higher ones, may also enjoy a certain social inheritance; but man's social inheritance is so incomparably greater and more important in determining the character of his life, that he is in this respect qualitatively different from all other animals.

II

Now, with all this in his eyes, the biologist interested in the problem of the inevitability of war and the desirability of it sees the situation as reducible to rather simple terms. If man prefers, or surrenders himself, to be ruled in his relation to fighting and war by his biological inheritance, then war will persist. Or if he decides that the best way to develop the highest type of man and human culture is to depend primarily on the natural selection based on a ruthless, physical, life-or-death determining struggle for existence, with a survival and dominance of the materially strongest, then war is desirable.

But if he recognizes that he must take into account, in his study of human development, another evolution factor, not less natural, and of proved effectiveness, which is based on the mutual-aid principle instead of the mutual-murder principle, and one which can be backed by all the force of social inheritance to counteract certain opposing influences of biological inheritance, then war need be to him neither inevitable nor desirable.

The protagonists of inevitable war declare that human nature does not change. The biologist declares that human nature does change, both by virtue of the influences of strictly biological factors, and especially by virtue of the influences of social inheritance. Human nature to-day, which is certainly not the same as human nature in early Glacial time, is quite as much the resultant of the work of social-inheritance factors as it is of factors of biological inheritance. Human nature — not just the part that is inherited, but the whole of it, including the part that is acquired by each generation — not only changes, but can be made to change in definite direction by education; and it can be made to change with reasonable rapidity—a rapidity that seems very rapid indeed to the biologist accustomed to see change mostly depend on slowly modified heredity.

Let us turn now to one or two more of those problems which especially involve in their consideration this matter, introduced by our reference to the war-problem, of the two kinds of inheritance and the relations between them.

The problems that I have especially in mind at this moment introduce conspicuously the subject of human heredity. Is a man what he is because he is born so, or because he becomes so by education, using education in the broad sense of including all environment?

With the work and theories of Mendel and the three botanists, Tschermak, Correns, and DeVries, as stimulus and basis, there has been an energetic pushing on of heredity studies, with a rapid gaining of many facts and much understanding, until now we are able confidently to make statements about the heredity mechanism and behavior that are really startling in their preciseness and practical importance. We can make enough prophecies about the outcome of many cases of mating, to give us sufficient basis to warrant us in mod-

ifying our social inheritance in directions intended to increase advantages or decrease disadvantages derived from biological inheritance. Not all traits are inherited according to the Mendelian order, but many are. This order can be found out if it exists, and then from it can be predicted the outcome of certain matings.

It must be found out by experiment (in lower animals and plants), or observation (in human beings), for each specific trait in each species of plant and animal, and for man. It will take a long time to work out the order of heredity for all the Mendelizing traits, physical and mental, which the human species possesses; but it can be done; and then we can bring to bear the power of our social inheritance, to make human life rapidly better by encouraging the good and discouraging the bad in biological inheritance.

But we do not have to wait until we know the order of inheritance for all our traits before we can begin to use wisely this new knowledge of heredity, which began with the revelations of the Augustinian monk Mendel, about the inheritance of stem-length and pod-shape and seed-coat of garden peas. We can begin on a basis of the knowledge of the heredity behavior of a single trait. Let me give an example.

For a long time the characters considered in studies of heredity were exclusively physical ones. Just as in the beginning days of anatomical study man's body was considered too sacred to be submitted to dissection, so in the beginning days of heredity study man's mental traits were considered too sacred for scientific analysis. But ever since Galton, students of human heredity have paid attention to the inheritance of mental traits and general mental capacity. It is a fascinating thing to trace the descent of genius or great talent through the succeeding generations of a family. The Bach family contributed an extraordinary number of notable musicians to the world, in several generations. But, if mental capacity is inherited, so is mental incapacity. It has been fairly satisfactorily proved that the mental condition of feeble-mindedness not only is an inherited condition, but may be looked on as a unit human trait, following the general Mendelian order as to its mode of inheritance. If this is really so, — and it is hardly any longer open to doubt, — it has obviously a most important significance in connection with the whole problem of education. It must make us face squarely the situation that there are limits to the educability of certain individuals, and that we should somewhere call a halt on our vain efforts to put the same kind and amount of education into all kinds of pupils.

This fact of the heritability of feeble-mindedness has also an important significance in connection with a particular social problem — that of juvenile delinquency; for it has been proved beyond much doubt, by the studies of Goddard, Davenport, Kuhlmann, Williams, and others, that feeble-mindedness and delinquency are all too often closely linked in terms of cause and effect.

III

Now these three matters of war and juvenile delinquency and racial well-being are but three examples of the many problems of human life having obvious and fundamental biological aspects. But how little has the world, although intensely interested in these problems and anxiously trying to solve them, taken any advantage of the special knowledge offered by the biologist in connection with them. And this despite the fact that it has been in recent years quite the fashion to invite the biologist to talk about such problems,

and even to listen to him with a tolerant interest. But why this fashion of listening to his advice, and at the same time the fashion of not acting on it? Well, it is not all the fault of the public: it is partly the fault of the biologist.

In the first place, the biologist seems unable to escape from the use of a terminology that is to be found only in the larger dictionaries — and these dictionaries are at home, while the public is in the lecture-hall. There are hundreds of interesting and pertinent facts of biology that are to-day awaiting intelligible telling in order to be made use of!

In the second place, the biologist apparently has difficulty in estimating the varying degrees of practicalness of his knowledge. Take the very examples I have used in this paper. If the biologist has nothing more to contribute to the discussion of the tremendously important and pressing problem of war than the assurance that human evolution will carry us beyond war in another geologic epoch or two, he may be listened to with tolerant interest, but he will start nothing to help put an end to war.

Of course, I think that he really has more to offer. I have even tried to indicate what it is that he can suggest, namely, to fight the false notion that human evolution must be left to natural selection, and that war produces natural selection; as a matter of fact, war produces artificial selection more than natural selection, and a bad or reversed artificial selection at that. He can also encourage the right notion that a certain biological inheritance, especially that already vestigial, can be largely offset by social inheritance. In fact, it is social evolution, not biological evolution, that we must chiefly look to for future human progress. Most anthropologists agree that the major difference between present man and primitive man — not man of the early Ice Age, but primitive man of late pre-historic times — lies less in physical differences and mental capacity, than in the possession by present man of methods and technique based on scientific knowledge not possessed by primitive man; that the difference is chiefly one of social inheritance, and modern man has gained over primitive man in this regard with ever-increasing acceleration. His movement of advance has been like that of a snowball, rolling faster as it gets bigger. Many biologists believe that man is already so specialized an end-product of his evolutionary line, that, as regards physical change and actual mental capacity, he has reached the standing-still stage. Certainly man to-day, as individual, is not to be regarded as superior to man of early historic times, of the times of Greek greatness, or, probably, even of the times of early Egypt and Asia Minor.

In connection with the matter of juvenile delinquency and racial well-being the biologist's contribution of facts and suggestions is of tangible practicability. The biologist says that the normal man who married a feeble-minded woman and started a line of descendants of whom four out of five were socially incompetent, and hence burdens and dangers to society, and who then married a normal woman and started another line of descendants, all socially competent, should have been prevented from making the first mating. Don't call this eugenics — call it an application of scientific knowledge and common sense. Think of it as just as important and just as possible as the enforced isolation of a victim of infectious disease, or of homicidal mania.

But not all the problems of human life, in the discussion of which the biologist ventures to take part, exhibit their biological aspects so clearly as the ex-

amples thus far referred to. The approach of the biologist to these other problems, even his right to approach them, becomes more debatable — but, for that very reason, perhaps, more interesting. Can the biologist, with his methods of analysis and his knowledge of other kinds of life than human life, make any, even least, contribution to those things which most of us demand first from existence, namely, personal achievement, personal service to humanity, personal happiness? Can he show us wiser ways of living? He can unquestionably show us safer ways; and presumably for that reason alone it is quite worth our while to call on him to give us the benefit of his special knowledge and his reasoned recommendations. But merely being safer amid danger is not what many, very many of us, are chiefly concerned with. We want continuing to live to mean something continually larger. Has the biologist anything helpful to suggest about this? Or will listening to him mean more pessimism, hopelessness, fatalism? If so, perhaps we would prefer to be blindly hopeful, ignorantly happy.

IV

I can understand, although I do not share, a certain feeling of repugnance to accepting the situation forced on us by scientific fact and logical induction. I can sympathize with, although I do not accept, the position of those who persist in wishing and trying to look on themselves and human kind in general as of a different clay, endowed with a different breath, and existing in a different sphere from the rest of life. I can feel the egocentric urge that leads to this position perhaps as strongly as those who take it, but I cannot surrender to it as easily. Scientific observation and cool reason prevent. How can one accept eagerly and gratefully that knowledge about our bodily make-up and functioning which the biologist gives us, and, on the basis of it, proceed to modify our behavior so as to protect ourselves from accident and disease, and help ourselves in the attempt to adapt ourselves to the actual conditions of the world we live in, and yet reject other no less well-demonstrated facts of the same general category, brought to us by the same biologist, but the acceptance of which involves the recognition on our part of our true place in Nature.

I am inclined to find an explanation for this popular inconsistency in two or three different causes. For one thing, some biologists have gone ahead of the actual facts with their justifiable significance, and have presented the world with hypotheses instead of demonstrations, and have insisted on an acceptance of unjustifiable significance. For another thing, one can never get away from letting one's own observations, with all their limitations as to both scope and accuracy, play a too large part in determining one's judgments about any matter, however technical, and however demanding, for correct understanding, a certain special training and equipment on the part of the observer. This is one of the reasons why the professors of political economy and sociology have such a hard row to hoe. Everyone is his own economist and sociologist, because the subjects are, perforce, under everyone's observation, although this observation may really be very limited, and usually is of a most untrained and unmethodical kind. Professors of astronomy, on the other hand, are accepted unhesitatingly as authorities — so few of us have telescopes.

Now the biologists have a position between these extremes. When they talk about microbes and dinosaurs, their statements are accepted at face-value. But when they talk about hu-

man beings, whom they can study quite as carefully as they can other kinds of beings, there are reservations. When the biologists' talk about human beings is limited to statements about lungs and liver, skeleton and ductless glands, it is not questioned. But when their talk is about the behavior of human beings, about their psychology, their heredity, their responses to environment and education, and their position in nature, then it is tested by the miscellaneous personal observations and prejudices and desires and hopes and beliefs of each individual, and it is accepted or not as it confirms or contradicts each one's notions derived from these things. We all, or most of us, think we know human beings as well as the biologist does. Most assuredly the biologist does not know all that is to be known about human beings; and about that which he does not know we must certainly be permitted to accept our own guess as likely to be as good as his. But we are too likely to think our own guess even better than his.

This latter attitude comes largely, I think, from a feeling, after hearing the biologist talk about human life, that his consideration of this life is too academic, too technical, too detached from most of those things that make up our immediate interests and fill our present moments. The matters that occupy our principal attention are our work and recreation, our clothes and food, our household affairs, our health and our looks, our income, expenditures, and savings, the growing-up of our children and the growing old of ourselves, our family and social relations, our personal contacts with people, and our opinions of them. We think and talk about books and music and pictures, about railways and bridges and motorcars, about scenery and climate and hotels, about politics and diplomacy and governments. And all the time we give a fascinated attention to the particular human beings connected with these things, especially the ones we personally know or see. We note and discuss their particular idiosyncracies, their likenesses and differences; we compare them with each other and with ourselves. We are concerned, constantly and immensely, with individuals.

It is right at this point, I believe, that we have a clue to the explanation of the gulf between the biologist-student of human life and the everyday observer of human life. One deals primarily with the species, the other with individuals. One gives his attention to human-kind, the other to particular human creatures. If we knew other kinds of animals as individuals, — and we *do* occasionally, as when we have a particular horse or dog or cat or canary for companion, or scrape literary acquaintance with Lobo the Wolf, or Bre'r Rabbit; I have even come to know individual bees in my glass-sided observation hives, — if we knew other animals as individuals, I say, we should have another point of view regarding them. But, as species, they do not interest many of us very much; although it is exactly as such that they do interest the biologist. And it is primarily as species that the biologist is interested in human-kind. That is why the biologist's information to us about man leaves us cold. And why the daily newspaper's information about men fascinates and thrills us. And yet — and yet — the biologist's information, so far as he can confidently go with it, is of huge importance to us as individuals. Taken into account and acted on, it can make wiser, less wasteful, more capable, happier individuals of us. And it need not rob us of the hopes and beliefs that many of us cherish. It may do nothing to encourage them, but it cannot, certainly at present, make us give them up. And I do not think it ever will.

V

I have had, during the very writing of this paper, the distressing experience of being brought, suddenly and dramatically, to face that problem of human life which to most of us is the greatest of all its problems — I mean the problem of death. One evening, on a train from Chicago to Washington, returning with a companion from a week's association with hundreds of other scientific men, I spent the hours between dinner and bed-time discussing with my companion the possibilities of science in helping us to understand Nature and Life. He was a man who had given thirty years, with all the advantage of great ability and highly perfected training, to scientific study. He was withal a most attractive and lovable personality. We parted at the evening's end with smiles of friendship and mutual encouragement to push on with the task that we had in common. In the morning I found him dead in his berth.

What does the biologist have to tell us of death? Well, first, true to his professional interest, he tells us of the facts and the significance of the death of species. Death of species is at once the revelation and the proof of the struggle for existence, with the consequent survival of the fit. Dead species have been the stepping-stones to new species; their history is the history of organic evolution. Species are unfit, or become unfit, for various reasons; among them, the reason of over-specialization. This is rather surprising, for all organic evolution is a movement from generalization toward specialization; yet, in the very acquirement of this specialization are sown the seeds of species-death. What organisms gain in specialization they lose in plasticity. They become so adapted that they lose adaptability. Progress in one direction involves, as someone has said, the closing of the gates in countless other directions; progression thus means a succession of lost opportunities. The Irish stag, specializing in antlers, was brought by too large antlers to species-death. The great dinosaurs, lords of their epoch, extinguished themselves by too much muchness. There are even analogies of these biologic happenings in human history. And there are even biologists who see the triumphantly super-specialized species, man, in actual danger of species-death from too much specialization.

But one of the major lines of human specialization is what might be called a specialization in the direction of safety from over-specialization; it is a specialization in general adaptability, not in particular adaptation. Man has become able to follow varying natural conditions. Man's narrow biologic specialization — think of the narrow limits of temperature, oxygen, food, and other conditions, in relation to his mere maintenance of life — is offset by his wide social inheritance and his educability. This gives him the power to withstand and dominate antagonistic nature — even the power to add the forces of nature to his own forces. He fights against natural selection; he substitutes a purposeful artificial selection for it. His possession of consciousness, reason and volition, by which he makes effective a scientific method or technique of successful struggle with nature, seems to insure him against species-death, at any rate in any geologically near future. Cataclysmic world-change would wipe him out easily, so specific is his biological adaptation to present conditions; but slow change — and that seems the geologic rule — finds him well protected, so developed is his power of conscious adaptability and his partial control of the conditions of life. 'What a plastic little creature man is!' said Emerson. 'So shifty, so adaptive! His

body a chest of tools, and he making himself comfortable in every climate, in every condition.'

But it is not human species-death but human individual-death that most of us look on as the problem of death. It is here, as always, in *individuals*, including our individual selves, not in *species*, that most of us are principally interested. What has the biologist to say about this kind of death?

Truly, very little. To explain to us that the human body is a machine that differs from other machines with which it may be compared in that, when it is once stopped, it cannot be set going again, is not in the least to solve for most of us the great problem. Is death really just what it seems, and what the biologist describes it to be, or is it what so many would like it to be, hope it is, and even firmly believe it is? Can the human individual have an ethereal spirit existence apart from, or after, his bodily-machine existence? Is man immortal? That is what we insist upon asking the biologist, who assumes a knowledge beyond that of most of us concerning human life.

The biologist, unless he is a scientific bigot, confesses at once the limitations of his knowledge. He does not claim that his description of individual death necessarily tells the whole story. But he claims that it tells it so far as the kind of evidence which he can accept as telling him things he can rely on now permits. Just because a single part in the complex material machine, or association of engines, that was my friend's body, suddenly breaks down, is that the end of his story? One evening, all that nature and man had done for him were available for our good and his happiness. The next morning, because a trivial mechanical disharmony prevailed during the night over what had been for fifty years mechanical harmony, he is nothing more to us or himself. This seems preposterous, incredible. Must we accept it, biologist?

Sadly he answers, 'I can give you no comfort. That same waste of Nature's efforts — if it really is waste — is apparent all through the realm of life. This unconscious waste of Nature is no less preposterous, incredible to me,' he says, 'than that every now and then, consciously flying in the face of what seems to be all self-interest, all enjoyment of life, all reason, millions of men swarm out of their homes, to use all their energy, all their native cunning, all their hard-won scientific knowledge, to kill each other, to bring intense suffering to their wives and children, to destroy their accumulated material possessions, to burn the created glories of their artist geniuses, to work, in a word, all the waste and misery that are the inevitable accompaniments of war. Is this less incredible,' he asks, 'than that Nature should tolerate the extinguishing, after a period of functioning, of the complex of elaborately built-up machines which is the human body?' And he adds that the same extinguishing comes to every other animal machine, to all other living bodies. Do you ask for something to continue after death of the pet dog, the favorite riding-horse, the bird you shoot as game, or the insect you crush under your feet? 'I find no proof, scientific proof,' he says, 'that death is not the end of these creatures. And you do not ask me to believe otherwise because of any desire or belief on your part that death is not their end. Well, no more do I find any proof, of the kind I am familiar with and content to accept, that death is not the end of man. I do not say that death is the end, that I have scientific proof that it really is the end; but I have no proof, yet, that it is not the end. The strong desire and hope, and that next conscious state, belief, which you suggest to me as proof to you that death does not end

all, are not the kind of proof on the basis of which I ask you to accept what I do really feel able to tell you as facts about human life, facts many of which you are inclined to accept on my word.

'Nor have I been able to find proof — the kind of proof that proves things to me — of immortality, by attending spiritist séances, or by reading the volumes of the Society for Psychical Research, or the many other books that recite the experiences of alleged participators in, or observers of, things of after death. I should, indeed, truly be appalled by death,' the biologist says, 'and it would have a terror for me greater than it has even as a possible complete extinguisher of my personality, if it meant that it was the beginning for me of a perpetual personal spirit-existence, in which my thoughts and conversations were to be of the kind exampled by those recorded in the Psychical Research and spiritist books. I do not wish to spend a spirit-existence responding to calls from earth to describe the quality of the cigars that I am permitted to enjoy in my eternal life beyond.'

But in the same breath the biologist says, if he is not a bigoted biologist, that he has no right to say, and will not say, that there cannot be a human spirit-life.

He cannot authoritatively, and hence will not try to, affirm that there cannot be human immortality. He simply remains agnostic. He does not know.

VI

Then there is the cognate matter of soul in the living body. The biologist sometimes has a difficult time trying to understand what other people understand by soul. If sweetness of disposition or amiability of character is a symptom of soul, as he is told by some, then he finds soul in many animals. I had two tarantulas once in my laboratory, one of whom was an ugly-tempered morose brute, who, whenever I approached him with playful finger, became angry and, rearing on his hinder two pairs of legs and unfolding his great poison-fangs, made ready to lunge and strike whenever his malicious intelligence assured him that he could reach and wound me. But the other tarantula, of the same kind and found in the same field, would let me fondle him and would walk in friendly fashion up my bare arm, without ever a thought of hurting me. He was a sweetly dispositioned tarantula.

If you say that I should not attribute character or disposition to these spiders, but should limit myself to describing their manner of behavior, because we do not know that their behavior was controlled by their disposition, — chemical or physical stimuli may have controlled it, — then I reply that I can quite as easily and much more confidently describe the similarly contrasting behavior of two human individuals in terms that we usually limit ourselves to in describing animal behavior. The difference is, we have had so much experience with human individuals, that is, have made so many observations and so many experiments on them, that, in our search for the springs of this behavior, we have become accustomed to saying that such and such behavior indicates such and such kind of disposition, a large or small possession of kindliness, or, as some might interpret it, soul. If we knew tarantulas better, we might be able to use the same generalization, and discriminate among them as fairly.

Mother-love reveals the human soul, says one; but mother-love is a commonplace among the higher animals and some of the less high. Love and sacrifice of self for family and community prove soul: well, the worker bee works till it falls dead on the threshold of the

hive, with honey-sac or pollen baskets filled with food, which it is bringing home to feed the babies and queen and drones of the hive. Faith in an all-wise and all-kind God proves the soul in us. The primitive Africans have no less faith, although their God is made of wood or mud. John Muir's dog, Stickeen, seems to have had no less faith in his master, at whose insistence he leaped the dangerous glacier crevasse that seemed too wide. Had Stickeen a soul?

But other people mean other things by soul: they mean the creative imagination, the capacity for self-expression of the wonderful things in them. Yet a simple physical injury or disharmony in these material body-tissues means a prompt end to all these wonders. A boy companion of mine was called, because of what he could do in music, a genius. He fell one day from a gate-post and struck his head against a stone. In a few weeks he was as strong a boy as he had been before, but he was no longer a genius. There was no longer any soul in his music. Was it his soul that struck the stone? Soul seems to mean, or at least to require, continuing mental balance.

The brain is a wonderful instrument in some human beings; in others, whole communities or tribes of others, it now enables its possessors to count no more than five. Trained human reason does wonders; so does the untrained instinct of the social wasps and the fungus-farming ants. The Brooklyn Bridge is a triumph of engineering; so is the orb-web of the garden spider. I do not mean that there is no difference between the brain of man, on which seems to depend a part at least of his soul, and the cephalic ganglion of the ant. But may not this difference be one of mass and histologic differentiation and organization, rather than of fundamental kind or quality; may it not be quantitative rather than qualitative? For all practical purposes, this difference may be such as to make two very different sorts of creatures out of men and ants; but is one to be assumed to be fundamentally foreign to the other? so fundamentally foreign that one means soul and immortality and the other only carnality and clay? Perhaps it is: I do not know.

Much that means soul and human attributes assumed to be peculiarly and fundamentally derived from some source other than one common to other forms of life, has been plausibly shown by biologists and sociologists to be a highly developed derivative of more animal-like attributes. Love may be a beautiful outgrowth from the animal necessities of reproduction and protection; charity, from the requirements of an advantageous development and exercise of altruism in the case of an animal species that has adopted the mutual-aid principle in evolution rather than the mutual-fight principle; hope and belief may be the by-products of a brain-development that has outrun utility, even as the Irish stag's antlers outran advantage in size.

Emotion itself is a great problem. There are fundamental emotions or conscious states, such as fear and hunger and sex-interest, which are plainly closely related to the animal part of our life; and other less fundamental, or derived, emotions, such as desire, hope, and confidence leading to belief, and doubt and depression leading to despondency, which are apparently a product of our more intellectual life. But that is to say that they differ from the fundamental emotions common to other animals as well as ourselves only because of our more elaborate and superior nervous development. These derived emotions are among the particularly distinguishing attributes of human life as compared with animal life, and

play a great part in all of our everyday living. We see more of them, are impressed more by them and think more about them, under ordinary circumstances, than we do about the more fundamental emotions; but how quickly and powerfully the fundamental emotions dominate us, under circumstances that strip off for the moment our veneer of social inheritance and of so-called peculiarly human qualities. The war revealed this vividly, although it also revealed how some individuals had arrived at a stage in human evolution which enabled them to dominate their brute-inheritance in a most wonderful and encouraging way.

An authorized lecturer, representing a certain organization with many adherents, stated in an address in Washington the other evening, that the world is a mental phenomenon, and hence that all the things we know in it are controllable by mind, or, indeed, are simply manifestations of mind. That rather seems to put in the hands of each person possessing mentality the power to do things to, or with, this old world, and the conditions of life on it, much as he wills to do them.

I must confess that the biologist sees the world differently. He finds it composed of a lot of things, and sees going on, in and about it, a lot of things that are hard to reduce to mental phenomena and hard to make amenable to his desires and control.

In Stanford University a number of years ago, I used to walk through an avenue lined with trees — I believe they were trees — to the beautiful quadrangle of buildings, with a companion, now a distinguished professor of philosophy in an important Eastern university, who proved during our walk each morning, by what was to me a verbally irrefutable logical argument, that there were no trees along our way and no quadrangle before us. However, when, after successfully avoiding the tree-trunks, we reached the quadrangle, we entered it quite naturally and unsurprised, and went on under its arcades to take up our duties in our respective classrooms in it. We, or rather the professor of philosophy, had simply had a pleasant after-breakfast exercise in mental gymnastics. I had done my gymnastics — other gymnastics — before breakfast.

The biologist is willing to bet his life that much of the world really exists in a material sense. If the philosopher and I were standing on a railway track, with a locomotive engine tearing toward us at fifty miles an hour, he might prove to me, if there was time, by his interesting play of words and logic, that nothing was there, and hence nothing was going to happen if our non-existent bodies continued to stand still on the non-existent railway. But I should win my bet that something very distressing would happen, unless we stepped off the track, and that pretty quickly.

The biologist is a homely and practical-minded person, who is little given to over-refined logic and debate, but much given to observation and experiment. His laboratory tells him what a precarious and fragile thing life is, how material and condition-ruled and circumscribed a living creature is. But his wife and child and his own consciousness tell him how much more, how immeasurably more, there is in life than he learns in his laboratory. It is this extra-laboratory observation and realization of the possibilities and actualities of human life that make it, even to the biologist, the vivid, many-colored, suggestive, and thrilling thing it is — the thing so full of occasionally realized great moments and of glimpses of infinitely great possibilities, that sometimes it seems all mystery, all something more than of this world, and hence all something quite hopeless to study

by the methods of his science, indeed quite hopeless even profitably to wonder about. Why not take it and make the most of it?

And then comes the insistent question: Ah, *how* make the most of it? And he becomes again the patient, struggling student of biology, the student of the laws or conditions of life.

VII

The goal of the biologist — however unattainable, or most limitedly attainable, arrival at it may now seem to be — is to be able to speak with confidence of the future behavior or fate of living things; of living things as individuals and as groups and kinds. The biologist really aims at being able some time to speak confidently about the future and destiny of human-kind.

If the biologist finds himself quite unable to say much that is worth listening to about the future of human beings after death, he is at least ready to venture some suggestions about the future of the human species in its material relations to the world and world-conditions it lives in, and about the possibilities or probabilities of its further development or evolution.

This evolution is a fundamental element in life. Primarily, it simply means change; but history — geologic and biologic history — has shown that this change has been progressive; it is change forward and upward. What causes it, we do not know, despite our glimpse of some of its factors; what it really is, we do not know, despite our sight of its results. 'Some call it Evolution, and others call it God,' sings William Carruth. But it is real. Human life to-day is what it is, because of it; human life will be to-morrow what it will be, because of it. Is the biologist in a position to hazard prophecy as to the future course of human evolution?

As Conklin has pointed out, progressive evolution of special lines of animals and plants has limits fixed by its very nature. Now man has gone a long, long way in the progressive evolution of his body and its functions. But it is apparently true, that for ten thousand years there has been no notable progress in this evolution. If evolution is carrying man forward, — and we do not doubt it, — it is doing it in a different way. This way seems to be the way of social evolution, based on man's social inheritance and the biologic factor of mutual aid. If so, we have to see man of the future as the possessor of an ever more elaborate and higher development of social inheritance, and more and more capable, by virtue of this social inheritance, of an inhibition of the vestigial brute carry-overs in his biological inheritance. That means, in the ultimate analysis, that future man can be consciously determined by man to-day; that human evolution has been turned over to human-kind itself to direct. What an opportunity, but, at the same time, what a responsibility!

Here is where the biologist becomes the preacher and exhorter. Here is where biology and the appeal to reason, where technical knowledge and common sense, where science and religion join. The soundest of science leads us to the conclusion that man, by virtue of the possession of a social inheritance, as contrasted with the biological inheritance which is all the inheritance that other animal species have, — a social inheritance which gives him the present realities and the future possibilities of a social evolution, in addition to his more personal evolution, — has in his own hands a great instrument for determining the fate of himself as species, the future of mankind. This, of course, is what the preacher and the poet have always said about man, though on a basis of other conceptions as to how

man has been given this power. But whatever the foundations may be for the agreement between scientist and preacher in their common conclusion, the interesting and important thing is that they do agree, and hence that they can reinforce each other in appealing to man consciously to direct his efforts, with all his advantage of scientific knowledge and all his strength of belief, to the production of a higher — a socially and morally higher — future-man type.

Biology is not a science for its own sake alone. It is a science eminently useful and practical to man, and at the same time it is a science highly inspiring to him. For if it be depressing, as it may be to some, though it is not to me, in that it teaches him that man's life is close brother to all the rest of life; yet it is inspiring, in that at the same time it reveals how wonderfully much has been done by Nature in making man, and how now man has been let into partnership with Nature for making better man.

We are not a foreign matter, or being, imposed on Nature, but Nature's own proudest product. And the power we have for our further and higher development is not our own unaided power, but our own and Nature's in combination. It is a combination that should have almost limitless possibilities.

INDUSTRY IN UNDEVELOPED COUNTRIES

BY BERTRAND RUSSELL

I

In speaking on this subject, I am conscious of great diffidence. I know little of industry, and still less of undeveloped countries; on both, many of my hearers could instruct me. I have therefore not attempted to advocate any very definite conclusions, but only to analyze the problem, and to set forth various solutions that have been suggested, or seem possible.

The problem of industry in undeveloped countries arises in three different forms, according to the nature of the population in the country concerned. There are countries that are practically empty, countries with a barbarous population, and countries where the population is more or less civilized, though not industrialized.

The case of a practically empty country does not arise very often, although the Yukon gold affords a fairly recent example. But in earlier times, this case was the most important. The whole of America and Australia come under this head, because the Red Indians and the Australian aborigines were too few and too feeble to count as populations. The settlement of the Western states of America, and subsequently of Western Canada, encountered only slight obstacles from the Indians, and was to all intents and purposes the development of an empty continent.

This case does not present the difficulties belonging to the development of already populous countries. In the development of empty but fruitful regions capitalism is seen at its best. Its harsher features do not appear, while its energy and enterprise are stimulated to the highest degree. The manner in which capitalism tackled the American West was admirable. It is true that there was corruption, and cruelty to early settlers, of the sort described in *Martin Chuzzlewit*. But when we compare the rapidity and prosperity of the expansion from the Alleghanies to the Pacific with the painful and laborious process by which the Atlantic seaboard was made habitable, we cannot but admit that modern capitalism is capable of wonderful feats. The task of developing empty regions is, however, nearly complete, and capitalism is less admirable in its more modern enterprises. This is one reason why, as a system, it commands much less respect than it did fifty years ago.

The outstanding example of the development of countries with barbarous populations is Tropical Africa. The problems that arose there were chiefly — (*a*) problems of competition among European powers, and (*b*) humanitarian problems. The former of these I shall leave out of account for the present, as I propose to deal, at the end of this paper, with the question of national rivalry. But the humanitarian problem is more of the essence of our discussion, because industrialism in its early phases tends always and everywhere to be very cruel, and this tendency is most developed in dealing with barbarous populations. The instance of the Congo under King Leopold is familiar. But one gathers that the Rand mines, in another way, involve almost equal damage to the native population, through the spread of disease — especially of consumption. Wherever industrialism comes across a barbarous population, it tends to use it up recklessly, just as it uses up raw material. This is part of the general character of wastefulness, of living for the moment, in a way that must lead to ultimate bankruptcy. And something of the same character is visible wherever an unindustrial population is industrialized, even though the population is not in other respects uncivilized.

The third class of undeveloped countries, namely those that already have a civilization of their own, is the most interesting class in itself, and also the one that specially concerns us in China. It is in this case that the really baffling and perplexing problems arise, and in this case also that the most interesting diversity of solutions has been attempted. Consider, for example, the three cases of India, Japan, and Russia, each of which affords lessons from which China has something to learn.

The development of industry in India has been in dependence on British capital, and subject to the condition that it should not damage our trade, especially the Lancashire cotton trade. It has been peaceable, quiet, and gradual, with probably less sweating and child labor than there would have been if a foreign power had not been in control. On the other hand, from the standpoint of a patriotic Hindu it may be urged that the development has been too slow, as also that it has not been sufficiently all-round to make India self-sufficient. It is doubtful, however, whether these are evils except from the standpoint of Indian patriotism; from an international point of view they may even be advantages. I leave out of account, for the moment, the effect, for good or bad, of British domination on Indian civilization.

In Japan, a quite different course has been pursued. Japanese industry has arisen in connection with Japan's strug-

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RACE AND AMERICANIZATION

By Vernon Kellogg

THE Americanization of the American nation seems to be a major problem of the moment. Many of us suspected, perhaps knew, before 1914 that it was a major problem; but the years of the war made all of us see it.

The "melting pot" has been a phrase in our mouths for a long time. But it has been for most of us a phrase that chiefly connoted picturesque Chinatowns, singing Italian side-streets, stolid Scandinavian farms, *gemüthlich* German beer restaurants. It is now a phrase that has gained in seriousness in the same measure that it has lost in picturesqueness. We know now that simply being in America is not all there is to being American.

So we are suddenly intent on Americanizing America. There are societies and propaganda and state and national enactments to help make America American. All very good in aim, and helpful, to some degree, in effect; but all relying on education and legislation directed towards making people over into a different kind of people. Education and legislation are the great stand-bys, the great panaceas of democracies. They have done and can do great things for us. Can they do all things? Can they make an American race out of the American nation? For that would be a great help in solving the problem of thorough Americanization. We need an American race, an American breed, if we are to have fundamental Americanization. With an American race to build on, an American nation thoroughly Americanized, with every hope of permanency conditional on ordinary wisdom, can be easily achieved.

There is a difference—it can be a great difference—between nation and race. Race came before nations in human evo-

alter Chapter on Washington D.C. discussion of the Negro -

lution. Race is basic in human evolution; nation is superstructure. Race has gone on intensifying while nations have arisen and passed. This is not to say that races, too, may not arise and pass. We know that some old races have disappeared; that others have been modified; that, by this modification, new races have developed in the course of those many years, a half-million, perhaps, of man's inhabitancy of the earth. But while changes in nations have often been made by education and legislation, changes in races have been made by extermination or biological isolation or amalgamation and modification. There has also been in the evolution of the human races that we know to-day an element of time involved, much greater than the time element involved in the development of the human nations which exist to-day.

The biologist has a great respect for time. It takes much time to effect biological evolution; races are products of biological evolution. It takes much less time to effect social evolution; nations are products, largely, of social evolution. The effects of biological evolution are fundamental; they are handed on in our biological inheritance. The effects of social evolution may be large; but they are not fundamental in the same sense that biological effects are; they are handed on only in our social inheritance. They demand continuous, deliberate, voluntary repetition; they must be maintained artificially, as it were. Biological effects repeat themselves in each generation involuntarily. They need no artificial maintenance. To the biologist race is a real thing, fundamental in the individual; nation is an acquired character, an immediate response to environment, but not heritable, although capable of being maintained, by environmental influences, through successive generations.

Hence the biologist sees in the problem of Americanization something more than an affair of nation and of environmental influences, such as education and legislation. He sees below or within the nation the race or races with their

character indelibly moulded and fixed by long biological evolution. He sees the population of America made up of representatives of various races as well as representatives of various nations. The problem of the Americanization of the American people, the problem of the American melting pot, is, therefore, a problem which involves a consideration of race as well as nationality; it is partly biological and partly educational. And the biologist believes, indeed he knows, that in any full consideration of it, the biologic part must be as clearly recognized and squarely faced as the educational part. It is to the biological part of the problem of Americanization that I wish to call special attention in this article.

For help in this connection we turn for information especially to two particular phases of biological study, namely, anthropology and heredity. Anthropology is a science which has had a great development in recent years because of the many finds of the relics of prehistoric man that have been made since the beginning of this century. A new and much more precise knowledge of heredity has also been gained since the beginning of this century. The revelations that this recent study of heredity have made concerning hybridization, in- and out-breeding, and the hereditary behavior of special characters or traits are very pertinent to any serious consideration of the biological aspect of the problem of Americanization.

When the biologist student of Americanization begins to make an anthropological study of the American population —the population that it is desired to Americanize—he is struck first of all by its racial variety. Not only are there represented in it a large number of the secondary or subraces or breeds of humankind, but there are also represented the four primary human races—the white (Caucasian), the black (Negro), the "red" (Indian), and the yellow (Mongolian). Among the representatives of the white race, there are numerous sub-races, as the Teutonic, Celtic, Gallic, and

Slavic. Although each of these is a more or less mixed race, each nevertheless possesses biologically heritable, hence fundamental, characteristics, peculiar to it and distinctive of it, characteristics not to be made over, certainly not rapidly, by education or legislation. Some of these characteristics in each race are good, some bad.

We prefer the characteristics of the white race, taken as a whole, to those of any other primary race. We believe that the various sub-races of the white race have contributed more, or, at least, are now contributing more, to civilization —in scientific terms, human evolution, especially human social evolution—than any other race. But we must not forget the large contributions to civilization made by the yellow race in earlier years. Such contributions betoken racial characteristics of capacity, both physical and mental, and of value as a basis for human development.

Our nation is essentially a white nation—despite the fact that one-tenth of it is black and that much smaller parts are red and yellow. The majority of the American population represents stocks derived directly from various capable white sub-races, or biological combinations of them. They are breeds of good biological endowment, and in their crossings with each other—the biological mode of national assimilation—they produce good results. But what of the biological combinations produced by crossings of the primary races? Do these crossings occur, do they tend to occur in increasing number, and what are their results, looked at primarily from the biologist's point of view? And can we discover differences in the biological endowment of the different white sub-races, and in the combinations effected by their hybridization? Are some of these better than others? All these are elements in the problem of Americanization which ought to have intelligent and intensive attention before we even begin to think about education. Education, and environment in general, can make the best, or the worst, out of natural endowment. But they have to work with

what nature gives them to work with. They cannot make bricks without straw.

All the races and sub-races of humankind can make fertile cross-matings, and the offspring produced by these matings are themselves fertile, either when mated with other offspring like themselves or when mated back to the original stock. This free cross-mating with the production of fertile offspring is the chief physiological test of species distinction. While a few animals recognized as of different species can mate together and produce offspring and, more rarely, offspring which may themselves be fertile, usually the crossing of species produces no results, or, if any, only infertile offspring. The crossing of the horse and donkey with its infertile product the mule is a familiar instance of this latter case.

We recognize, therefore, all the known races and sub-races of humankind, however much they may differ in appearance, as belonging to a single species, the human or man species, *Homo sapiens*, only existing member of the zoölogical genus, and even family, to which it belongs. Any biological combination of human races or sub-races is possible. But there may be and are differences in the value of these combinations. Some combinations result in producing hybrids of more vigor than either of the parent forms, some of less vigor. In some combinations the biological virtues of the superior race seem to have the upper hand in determining the make-up of the hybrid, hence the hybrid becomes superior to the inferior parent race, if not indeed quite equal and in certain cases even superior to the superior parent type. In more cases, however, the hybrid is distinctly inferior to the superior parent type, and in some cases the combination may be even poorer than the inferior parent type. But any prophecy in regard to the outcome of any particular human race hybridization must be based on the examination of many actual cases of such hybridizing.

Now, the problem of Americanization, because of the presence already in the American population of from few to

many representatives of all the primary human races and most of the sub-races, and because, unless radical changes are made in our immigration laws, more and more representatives of these different races and sub-races are bound to enter the population, and finally because all these races and sub-races can and actually do interbreed and produce hybrids of varying value (physical and mental condition and capacity), because of all this, any serious attempt at solving the Americanization problem must include a careful and unbiassed consideration by trained students of anthropology and heredity of the biological, hence fundamental, outcomes of these crossings. And the results of such consideration should be made known to the government and the public generally, and the significance, to the future of the nation, of the facts determined, insistently pointed out.

Some of the results of such biological consideration of racial crossing are already known. For example, the product of the white and yellow crossing seems usually inferior to either parent type. But the white and black cross seems usually superior to the original black parent type, although inferior to the white parent type. The outcome of the black and white crossing is particularly important to us; for this is a crossing that is going on all the time and is increasing in its rate. Already about one-fourth of the total so-called "negro" population is now of mixed white and black blood, and in the last twenty years the mulattoes have increased in number twice as fast as the full-blooded negroes have. It may be that assimilation or modification of the negro race in America is the best, or perhaps the only, solution of the negro problem; but it certainly seems to mean the production of a hybrid group, representing a considerable fraction of our population, which is inferior in average capacity to the white element of the nation, though superior to the pure black element.

But even if such a dubious biological solution of one phase of our Americanization problem may be possible, it certainly seems impossible in the case of another phase of it involving

the assimilation by hybridization of the representatives of another primary race different from our own. The representatives of the Japanese race, already here in limited numbers and more than ready to come to us, with opportunity, in unlimited numbers, do not care to be biologically assimilated—nor should we care to have them so assimilated. Even despite reported suggestions on the part of Japanese leaders that their people intermarry with the whites, they do not do so, at least, beyond a negligible extent. In the Hawaiian Islands where in a population of only about a quarter of a million an unusually large number of different races, subraces, and nationalities are living in close contact, and where hybridization is going on to an extraordinary degree, the Japanese, who constitute two-fifths of the total population and have every opportunity for taking part in these crossings, only rarely mate outside of their own group. They show a remarkable racial aloofness. In this they contrast strongly with the other groups, which mix freely. Hawaii is, indeed, a veritable biological laboratory of human hybridization. In a girls' school of one hundred and twenty-five pupils I discovered, some years ago, representatives of nearly twenty racial combinations. But the Japanese stock, although the most abundant single strain in the Islands, was represented in only two or three of these combinations.

On the contrary, the Chinese have mixed largely with other strains, especially the Hawaiian, the various Caucasian, and the mixed Caucasian-Hawaiian strains. So that if we were to decide our attitude towards Japanese and Chinese immigration on the basis alone of the possibilities of biological assimilation, we should favor Chinese rather than Japanese immigration. However, when we consider that any crossing of the white and yellow races results, on the whole, in a markedly inferior strain, perhaps we should favor, from a biological point of view, letting down the bars—if we let them down at all—to the Japanese whose racial aloofness will tend to prevent any hybridization.

But the biological aspect of the Americanization problem is not limited to a consideration of the results of the crossings of primary races, or of different yellow sub-races; it includes also a consideration of the results of the injection into our population of different white (European) sub-races, either to persist as pure strains, or to mix biologically with one another and with our own American stock, itself originally derived chiefly from two or three of these European strains.

Although these various European sub-races are by no means pure, despite my reference to them in the preceding sentence as "pure strains," each is sufficiently homogeneous to be characterized by a distinctive biological inheritance, and to be classified with some confidence with regard to desirability as a component of our nation. Much careful scientific study, unstained by political or partisan prejudice, is necessary, however, before these biological, hence fundamental, distinctions can be sufficiently defined for use in determining an intelligent attitude towards welcoming or rebuffing the would-be participators in the future American nation—and American race.

Indeed, we must go even farther than that. We must recognize the biological difference, that is, the different hereditary endowments, of the various groups within each of these so-called European races (white sub-races). Here we come close to the possibility of confusing characteristics produced simply by education and opportunity—environment in general—with inherent characteristics produced by selective mating within any one of these races. For example, in such peoples as have lived long under a sharp two-class system—like the peasants and landlords of Poland or Hungary, or the English groups typified by West London and East London—wealth, education, and opportunity, even health, may be the nearly exclusive possession of one class and thus may produce a distinction in the probable desirability, as immigrants, of members of the two classes. But this distinction, which may seem at first to be produced merely by

environment and hence not fundamental, may often involve a biological distinction because of the strong tendency for inbreeding in each of these classes, thus setting up distinct hereditary strains within the race or nation. As the environmental distinctions may have originally come about largely because of inherent differences in capacity between individuals, this restricted and selective mating may have perpetuated and increased certain hereditary differences between the members of the two classes, and accordingly these differences will have claims to attention from biological students of the immigration problem.

One of the points in the problem of Japanese immigration, for example, which is not sufficiently obvious to many of us, especially those of us not living on the Pacific Coast, is the marked difference in the quality of two types, which are really different biological strains, of the Japanese arrivals in America. For many generations the samurai class, including the rulers and warriors of Japan, have closely inbred, leaving the rest of the people to develop as a great group with distinctly inferior hereditary endowment. Most of the Japanese students, members of government missions, and successful business men who come to America, and who are almost the only Japanese seen by Americans not living on the Pacific Coast, belong to the samurai class. But the great bulk of the Japanese immigrants settled in California and other Pacific Coast States as laborers, servants, and little shopkeepers, are of the coolie class. They are of a strain biologically different from and distinctly inferior to the samurai. It is against their coming in swarms, to live in compact groups, racially and culturally aloof from the rest of the American population, that the Californians protest.

But not alone the hereditary endowment and the results of the crossings of the various races, sub-races, and distinct class groups must be taken into account in any biological consideration of our Americanization problem. We must also consider, in this connection, differences in the inherent

qualities of the very individuals of these different groups which come to us as immigrants. This is, of course, a still more difficult determination to make.

We can distinguish by our hasty port examinations the presence or absence among these individuals of various desirable or undesirable possessions such as disease (although usually not degrees of resistance or susceptibility to disease), physical infirmities, education, and world's goods. But character, temperament, mental vigor, and other inherent, and hence heritable, traits are not revealed to us. And the future of the American race—and nation—is going to be materially influenced for better or for worse by exactly these invisible possessions of the incoming future American citizens and producers of citizens.

In the old days when migration was difficult, those who were willing to effect it, and did succeed in effecting it, were likely to be individuals of a desirable inherent strength of will, imagination, boldness, adventuresomeness. The mere difficulties and uncertainties, even dangers, of migration resulted in a certain selection among the people of any race or sub-race or class group which for any reason contributed individuals to migratory movements. But nowadays when migration is simple, comfortable, and safe this kind of selection no longer exists. Indeed, a certain degree of reversed selection may obtain. It may be easier for an incompetent or lazy or weak individual to give up a hard economic struggle, or a harsh climate, and migrate to a region of kinder environment than to stay at home. The emigration to America of the Pilgrim Fathers and the Germans of 1848 undoubtedly brought us individuals of a better hereditary stock than those which came in swarms from Europe in the years just before the world war. The men who crossed the plains in prairie schooners in 1849 and the 'fifties brought a different blood to California from that which has come in sleeping cars in later years to be warmed and soothed in Los Angeles and Pasadena. The imaginative, active, venturesome Northern

Californian of to-day is not what he is so much because of the stimulation of mountains and sea and atmosphere as because of the blood of the pioneers that is in him.

The biologist sees Americans to be what they are first because of their race and sub-race and class group and individual blood—or, rather, as he would put it, germ plasm—and only second because of their freedom and opportunity. Without American opportunity even good germ plasm could not achieve what it does, but without good germ plasm opportunity can achieve nothing at all. So the biologist joins the journalist in viewing with alarm the pouring into our country of unselected, or badly selected, racial and individual germ plasm. He notes with dismay that the birth rate of inferior immigrant stocks is higher than that of our native stock. He worries about the outcome of hybridization between our superior native strain and inferior imported strains. He realizes that too much inbreeding may magnify any defects existent in our own stock, but he realizes, too, that inbreeding is the surest way of preserving its good qualities. Outbreeding may increase vigor, but if it involves an inferior race it lowers quality. He knows that if we are to have a homogeneous people there must be biological amalgamation of the various strains in our population, but if too many of these strains are inferior strains it will be a people of homogeneous mediocrity.

Now we have no laws, nor probably shall have in any near future, restricting mating except a few affecting close blood relatives and the very obviously mentally infirm. Eugenics, either individual or racial, has met with no authoritative favor among us. Sentiment overrules science and reason. We still legalize, and probably shall for some time, matings of criminal or feeble-minded germ plasms with similar or with normal germ plasms. There are to-day nearly as many feeble-minded persons in our country as there are college and university students. If they wish, these two elements in our population can fuse their two highly differently en-

dowed germ plasms and drop the racial mental average of the nation to a deplorably low level. All strains present in the population can mix as they please and offset, if they happen to mix badly, every advantage of good government, good education, and good opportunity. Good heredity offers a more fundamental basis for the Americanization we ought to have than good environment. We need good education, but we more profoundly need good race. The Commissioner of Immigration should be an anthropologist, exercising authority conferred on him by a Congress of biologists. And this authority and his own expert knowledge, should enable him to discriminate and decide, untrammelled by national or international politics, as to what kind of germ plasm should not enter our borders. For once here, this germ plasm will be a part of our national germ plasm and will help determine the fundamental character of our race and our nation. It will have its share in Americanization.

To help us out in Americanizing the germ plasm already in our country, in the way we want it Americanized, there should be a Commissioner of Americanization who should know more about the laws of heredity than about pedagogy or civics. And he should have authority to prevent the perpetuation of obviously bad and dangerous germ plasm and to prevent the degradation of good germ plasm by mixture with bad. Don't call this eugenics; call it scientific Americanization.

With these two men on the job, we can remain a great nation; we can become a greater nation. We can build up our American nation on the basis of fundamental individual quality, a quality that can be preserved and intensified and that will enable us to meet every stress or emergency although all the rest of the world rock in cataclysm. We can be a permanently strong nation because we shall have for foundation a permanently sound race. On this, successful Americanization primarily depends.

livelihood on some plantation or farm, watering flowers or cropping the lawn. It was during one of these periods of penury, when I had given him a job, that I caught him helping himself to my provisions. I dismissed him immediately; but we remained on cordial terms all the same, and he often came into my camp afterward, either to offer me pieces of art for sale or to borrow a shilling.

I once entered his hut, where he was living alone at the time, having just been deserted by his wife — a usual occurrence with him. There was no furniture except his stretcher; but everywhere on the ground stood old oil tins and clay pots filled with decorative plants, flowers, ferns, and low shrubs with berries.

I cannot help thinking that Beeboo, if he had been born in Paris, might have developed into another Rodin, or a male Rosa Bonheur. Born in the Middle Ages, in a cathedral town, he would surely have been a famous gargoyle-sculptor. But he, too, was not free of those aberrations in taste to which I have alluded before. One day he shaved the lower part of his head all round in a circle, and then let the hair on the upper part grow to an enormous length, so that he looked as if he wore a huge helmet of fur, like one of Napoleon's grenadiers. He looked fearful, and I told him so, to his intense delight.

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MOUNTAINEERING IN AMERICA

BY VERNON KELLOGG

I

By America I mean the United States without Alaska and the overseas appanages, and by mountaineering I mean much besides scaling high peaks. One cannot put all the qualifications into a title.

There is altogether too little told and written about the mountains of our country, — the high mountains, higher than the Alps, — and about the joys and adventures of climbing them. Because they are not snow- and ice-clad, — a few are, — with *névés*, *crevasses*, and ice *couloirs* to tell about, and because one does not climb them in a roped-together chain-gang, led and followed by professional guides in picturesque costumes, along well-known paths often staircased and balustraded, the mountains of California and Colorado seem to have few attractions for Americans who have a fancy for climbing.

But actually they demand as strenuous and careful work, and offer as much adventure, as the more favored and familiar European mountains. You can climb as high, fall as far, and land with as much disaster, in the Sierra Nevada or Rockies as in the Swiss or Tyrolean Alps. And there goes with the climbing itself in America a lot of fine things that do not go with the Swiss climbing — the camping, the pack-train, the trout-

fishing in almost virgin waters, the great forests, the aloneness, the real escape and change from that world which is too much with us — all these are pleasant surplusage in American mountaineering, added to the actual climbing, which latter, by the way, you do — as climbing should really be done, to get from it its finest flavor — on your own, unguided and unroped.

It seems an odd thing that the high peaks of the Sierra Nevada and the Colorado Rockies are all of about the same height. Take the highest twenty in each of the two mountain-systems, and not only will their average be very close to 14,000 feet in the case of each group, but the range of height in the whole forty will come within 500 feet above or below the fourteen-thousand-foot average. The high points of both Sierras and Rockies seem to have been cut off in their aspiring at fourteen thousand feet or a few hundred feet above or below that level — although there is little indication on many of these summits of any cutting off, the tip-tops of some, indeed, making two men standing close together on them seem badly crowded. But some, on the other hand, have a really truncated top, often surprisingly broad and level.

This is true, for example, of Long's Peak, one of the highest and best of the Colorado peaks — meaning by 'best,' most interesting, and possibly adventurous, to climb. One could lay out a very decent little farm on its summit, if the soil were a little further on in course of making — so far it is only in its first, or rock, stage. But in getting up to this broad, flat top, you have to work carefully almost completely around the great cliffy cap of the mountain, with a dizzying narrow ledge on one face, to test your head; a long steep trough, with snow and loose rock in it, at one corner, to try out your heart, lungs, and climbing luck; and a steeper, mostly smooth wall-face, to swarm up on the last stretch.

Long's Peak is much beset by wind and sudden sleet-storms, and its really safe climbing season is unusually short, although it is often climbed before and after this safer period. One such attempt at a late climb, however, cost an adventurous woman her life; and a headboard, fixed among the harsh rocks of the great Boulder Field just beyond which the real climbing begins, commemorated, as long as it stood, her death on the mountain from fall and exposure in storm. The inscription reads, —

Here CARRIE J. W——
Lay to rest, and died alone,

with the date, which I have forgotten.

She died alone because the local mountaineer who, after much protest, went up with her when she declared that, if he would not accompany her, she would go anyway by herself, and who found her helpless on his hands in a sleet-storm on the summit, had, after carrying her down the more dangerous part of the mountain, through hours of struggle in blinding snow and cutting ice-sleet, until he was almost as exhausted as she, left her at nightfall in the comparative shelter of the great rocks of the Boulder Field, himself to stumble on down the mountain in the dark, for help.

He had a difficult decision to make. Should he stay there with her, and both almost certainly perish before dawn, or should he take the chance of leaving her and possibly get help up to her during the night, and thus save both? He took what he believed the only chance of saving her. Alone, he could not possibly get her farther. Staying with her, he could have done nothing but, in all probability, die with her. He got down the mountain to his father's cabin. The rescuers started back at once. But it took long hours to get to her. They

found her dead. She had, in panic or delirium, left her shelter among the rocks, and, stumbling about, had fallen near-by, striking her head against the merciful granite. It has been always a haunting question with that man as to whether he had done what a brave man should do under such circumstances. Knowing the mountain and the man, I believe he decided as a brave and experienced mountaineer should have decided.

I know of another fatal accident on Long's Peak. There may have been still others. This one came about through a man's inexperience and foolishness. He carried a loaded revolver in his hip-pocket on his climb. He fell in a bad place, and the cartridge under the hammer was exploded, the bullet shattering his hip. His one companion did what he could to drag him along the narrow ledge on which he lay; but little progress was possible, and, after hours of suffering, the wounded man died. The companion was a prematurely old man when he finally got down the mountain and found helpers to go up for the body.

I have always maintained that there should be three men together on mountain climbs, one to get hurt, one to stand by, and one to go for help. But most men hunt mountain-tops in pairs; some like to go alone. I knew one such, — besides John Muir, who, with his bit of bread and pinch of tea, almost always went alone, — who did much climbing in the Sierra Nevada and took many chances. He used to carry a rope and, in difficult places, where he could not reach high enough for hand-grips, he would tie a big knot in one end of his rope and throw it up until it caught firmly above him. Then he would drag himself up, without regard to the fact that he probably could not get down more than the uppermost one of these places by using his rope. He trusted to finding a different and easier way down — and always did. He climbed Mount King — a very pinnacly peak in the King-Goddard divide, which juts out westward from the main Sierran crest near Kearsarge Pass — in this way, by one of its seemingly impossible faces. Although at best it is a difficult mountain, it has at least one fairly negotiable face. He came down that way.

II

American mountain-climbing, at all events as I am limiting it, is rock-climbing. There can be a good deal of snow on the symmetrical cones of the old volcanoes, like Rainier, Baker, Hood, and the others that are the high mountains of Oregon and Washington; and there are elsewhere occasional snow-patches and a few scattered, insignificant, persisting remnants of the once mighty local glaciers that did so much in the old days to give the Sierras and Rockies their present configuration. But these are rarely in the way of the climber; in fact, the ice-remnants have to be sought out to be seen, and are among the special goals of the mountaineers. Two or three in the Front Range of the Rockies, near Estes Park, now included in the Rocky Mountain National Park, are among the most accessible.

Climbing the American mountains, then, demands no special knowledge of the characteristics and habits and dangers of deeply crevassed glaciers, with their thin snow-bridges, or of the behavior of snow when it inclines, under proper weather conditions, to cornice-breaking and avalanche-making. But it does require, for safety's sake, a considerable knowledge of the character and habits of various kinds of rock in various states of firmness and brittleness, as met variously on cliff-faces or in narrow chimneys. It also requires some judgment as to the critical angle at

which loose rock may lie for the time quietly, yet may not be stepped on with careless confidence. It does not require ropes and ice-axes, but it requires hands as well as feet, and a steady head. Narrow ledges, hand-hold crevices on steep faces, knife-edges, both firm and badly weathered, and long steep troughs of mixed snow, loose stones, and easily excited granite-dust make earnest call on the American mountaineer's nerve and confidence and expert judgment of the possibilities.

It is not always the highest mountain, of course, that is the hardest, even in its demand on endurance, to say nothing of skill. Our highest point south of the Canadian border is Mount Whitney, yet it is but a tiresome steep walk to its summit, after one has made the long, beautiful, and inspiring forest- and cañon-trail trip to its western foot. Its eastern foot stands in a desert. A few miles north of Whitney is the slightly lower peak of Williamson, one of three closely grouped splendid Sierran notabilities (Williamson, Tyndall, Barnard). But Williamson offers everything to the climber which Whitney, except for its height and position, does not.

I had the privilege of spending a few weeks again last summer in the Sierras, after an absence of years. Our small party was composed of members of the Sierra Club, that organization which has done so much to make the California mountains known and accessible to mountain-lovers; and one of our group was intent on attempting to get up a certain peak which has long resisted the attacks of climbers — not that it has been so often tried, but that the few tries have been made by climbers well known for their success with difficult mountains.

We, therefore, pushed our pack-animals up a great side cañon tributary to the greater cañon of the Kern, until we could make camp in a last little group of tamarack pines practically at timber-line (about 10,500 feet here), and directly under a high northwest spur of this unclimbed mountain, which connected with its main peak by a long, rough knife-edge. From careful study of the mountain from various points, it had been decided that the most likely approach to the peak-summit seemed to be this northwest spur and knife-edge. In our previous movements we had nearly encircled the great group of which the unclimbed peak was one, and members of the party had climbed another mountain, not far away, mainly for the sake of an orienting examination of the upper reaches of the resistant peak.

The actual vertical height of the peak above our timber-line camp was only a little more than three thousand feet, as the Geological Survey maps attribute an altitude of 13,752 feet to it. But three thousand feet can be much more difficult than five or six thousand. However, if the summit could be reached at all, it could probably be done in a day from our high camp. So the climbers — properly three — made a five-o'clock start, aiming directly for the summit of the spur. The going, though steep, was fairly good and entirely safe, and the top of the spur was reached in a few hours. But the knife-edge, bad enough where it was continuous, revealed itself so deeply notched at several points, that it proved wholly impassable. It was necessary to try a different way. The north face of the knife-edged spur was as impossible as the knife-edge itself. But the south face is gashed by a number of narrow steep troughs leading almost up to the main peak, any one of which might prove itself, on trial, to be possible, but any one, or all, of which might be unfeasible because of interrupting cliffs not visible from the climbers' point of

view. To select and try one was, however, the only chance.

After a careful study, one was chosen that revealed indications of a trickle of water coming from some upper snow-bank, and seemed to be more winding in its course than the others; hence, would offer more protection than these from rolling stones. The climbers, therefore, worked their way from the knife-edge down, and laboriously across several other troughs until, finally reaching the selected one, they turned their faces upward again. There was much loose rock in the trough, and some small, but troublesome, cliffs running across it; but by skillful work it was successfully followed to a point where a short acrobatic scramble gave them the very summit. By half-past two the three men stood, or rather crouched, closely together on the dizzying point of the highest pinnacle of the mountain — and the Black Kaweah was no longer the unconquered peak it had so long remained. The near-by Red and Gray Kaweahs had surrendered in earlier years. So the Sierra Club has no more scalps to bring home from that fine mountain group. But there are still other peaks, both in the main Sierran crest and in some of the great lateral spurs, or 'divides,' that run out west from it, which offer pressing invitation to climbers who like to be the first to scale untrodden summits.

III

I referred at the beginning of this paper to the surplusage of pleasant experience that the American mountaineer may enjoy in the high mountains of California and Colorado, — one really ought not to slight Washington, Oregon, Idaho, and Wyoming in speaking of American mountaineering, — in addition to that of the actual climbing. This experience is that of the trail and camp.

For example, while the three more venturesome members of our party were capturing the Black Kaweah, — when one is soft from five or six years of being kept away from high altitudes, and has had only a few days to accustom heart and muscles to severe work in them, one must not be among the more venturesome, — I busied myself with providing one of the courses of a proper dinner that should be ready for the returned climbers. Right past our camp ran the clear, cold water of a stream that had its sources only a mile or two farther up the cañon, in the snow-fed lakes of a great glacial basin, or *cirque*, of successively higher levels under the Kaweah summits. Nine Lake Basin contains even more clear little green lakes than its name indicates, and their overflow makes a stream that has helped materially to deepen the great glacial gorge that extends from the upper *cirques* down to the Grand Cañon of the Kern. In this stream swarm hard-fighting, firm-fleshed rainbow trout, not too sophisticated, or yet too inexperienced. A Royal Coachman and a Black Gnat made a good killing combination, and I soon had a sufficient number to furnish the second course of the camp dinner.

And then there was time for some rambling and scrambling over the granite faces and great rough blocks of the upper *cirques*, and even over a low divide that separates the Kern from the Kaweah watershed; to look down the precipitous gorge of trivially named Deer Creek, — what a confusing host of Deer and Sheep and Bear Creeks there are in the mountains! — which finds its swift and tumultuous westward way into the Middle Fork of the Kaweah, or 'crow water,' as the Indian name translates itself. Along the upper stretches of this magnificent gorge — or cañon, to give its character its proper due — are some vertical cliffs and

Surplusage — a noun — from M.E. O.F. Medieval Latin, super (plus)

sky-scraping pinnacles and smooth-surfaced, onion-skinned granite domes, which are yet to have their fame in chronicles of Sierran scenery.

The trout-fishing in the higher Sierras and Rockies is a kind of fishing apart from other kinds, even from other fishing for trout. To get to it is an adventure; to live a few weeks, or even days, where it may be had is an exalting experience. It is so much more than fishing. It is realizing how the primitive granite core of the earth, and ice and water and time have combined to make great mountains, great basins, great moraines, great cañons. It is learning to know the giant trees and dwarfed alpine flowers. It is seeing close at hand the realities of the bitter struggle of life with boreal nature. 'Timber-line' is one of the strange and revealing places of earth, with its misshapen, scarred, fighting pines and fir and juniper, and swiftly growing fragrant flowers, which expand their brilliant colors in the short season of warm sun and melting snow, to attract the few hardy butterflies and bees that flit away their brief lives amid surroundings that awe and humble the greater animals and even man. Shrill-barking marmots and curious little squeaking guinea-pig-like conies perch on great granite blocks, to stare and challenge the human intruder in these upper levels of earth, and dive out of sight in the dark crevices as he turns to stare back at them.

But the trout themselves are reassuring. They may even be of the very sort you know in the meandering brooks of New England meadows. For many of the Sierran lakes and streams have been stocked with trout varieties foreign to their geography. One meets speckled Eastern Brook and brown Loch Leven in some of these waters. Most famous and most wonderful to see are the bizarre Golden trout, originally of Volcano Creek, which flows into the Kern from the foot of Mount Whitney. These trout were originally isolated in that part of the stream which is above the high falls, not far from the stream-mouth; but they have been transplanted into numerous streams and lakes of the Kern and Kings watersheds. They have a brilliant scarlet belly, roseate lateral rainbow line, and general yellowish-red tinge over the whole body. They do not seem to grow very large, but are curiously long and slender for their weight. They are reputed to be unusually vigorous fighters; but the few that I caught in the single stocked lake of Five Lake Basin above the Big Arroyo were tame compared with the native Rainbows of the Arroyo itself.

Besides trout, the Sierran and Rocky Mountain streams are the home of a few other interesting animals. There used to be many beaver, especially in the reaches where the Colorado streams flowed through the more level glacial parks, which are characteristic of the Rockies just as the narrow, flat-floored, vertical-walled cañons like the Yosemite, Hetch-Hetchy, Tehipite, and the Grand Cañons of the Kings and Kern are characteristic of the Sierra Nevada.

And there are the fascinating water-braving ouzels, that teeter, half-submerged, on the lips of little falls, as they seek out the larvæ of the water-insects. Among these insects are stone-flies and may-flies and, especially, many kinds of caddice-flies, which make their protecting cases out of tiny pebbles or granite grains, and sometimes out of glittering golden bits of iron pyrites and half-transparent mica — houses of gold and glass and shining jewels.

Finally, there are the curious net-winged midges, known unfortunately only to professional entomologists, and to too few of them, whose few species are scattered all over the world where swift, clear, and cold mountain streams

are. The small, slug-like larvæ of these delicate flies cling by ventral suckers to the smooth surfaces of the stream-bed over which shallow water is running swiftly. They cannot tolerate sluggish or soiled water. Their food is chiefly minute fresh-water diatoms, which often grow in felt-like masses on their own backs. The slender-legged, thin-winged flies may be seen occasionally flitting about in the overhanging foliage of the stream-side, or among the great boulders that half block the streams where they break through terminal moraines.

But besides the streams that help give the mountain regions beauty and interest and life, and provide the purest, softest water for the mountaineer's drink and bath, there are the great forests — forests great in extent and made of great trees. These forests are of special magnificence in the Sierra Nevada, but the lower pines and upper spruces of the Rocky Mountains form fine forests, the spruce, particularly, often running along the range-flanks in a miles-long unbroken zone, at an altitude of (roughly) from nine to eleven thousand feet and even higher. The trees are not large, as large trees go, but are nearly uniform in size, and the forest is almost clear of undergrowth, and is soft and dark and still.

Of birds there are few, but some of them are of special interest. Among these are the noiseless, ghostly camp-robbers, or moose birds, which suddenly appear from nowhere in your forest camp, boldly flying down to your very food-bags or camp-fire to beg or steal a free meal. Less quiet are their cousins, the Clark crows, or jays. But most beautiful of voice are the Western hermit thrushes, which fling out their rippling liquid notes at early dawn and twilight, to echo through the long forest aisles.

I remember one special adventure in the Great Spruce Forest on the flanks of Flat Top and Hallet's Peak in the Front Range of the Rockies, near Long's Peak, in which the hermit thrushes played a part. A college companion, Fred Funston, — later the hero of the capture of Aguinaldo and one of the best-known major-generals of the American army, — and I had gone up into the forest, with a single burro as pack-animal, from our summer camp on the Big Thompson in Willow Park, to try to get a deer, in order to vary our long-continued camp diet of bacon and trout. We were rank tyros as hunters, and probably could not have injured any deer with even the best of opportunities; but we had no chance to prove or disprove this, as we saw no venison despite all care and pains.

We did see, however, an animal we had not come to see. This was a big mountain lion. We had made a hasty camp in the upper reaches of the forest in the later afternoon of our arriving, and had turned Billy, the burro, loose, to nibble at anything he considered edible in the camp neighborhood. Then we had hurried out with our guns, each by himself, to post himself at what he should think a vantage-point to see such deer as should come conveniently wandering through the forest. I had lain doggo for some time near an old trail, and dusk had come on so rapidly, and the forest had become so unnecessarily still, that I had decided to get back to the cheering companionship and comfort of the camp-fire, when I was suddenly frozen into immobility by the sight of a great mountain lion silently padding along the old trail only a few rods from me. What with long lean body and long lifted tail, that lion took an amazingly long time in passing a given point. And just as it was by, and out of my sight, it carelessly let slip from its throat a blood-curdling cry, half-bestial, half-human. That

completed my demoralization. As soon as the apparition had passed from my sight and the echoes of that howl from my ears, I got my numb muscles into action and speedily made for camp — not by way of the old trail.

As I came near it, I was further startled to see a great, roaring fire, and found my companion, later the reckless hero of many a dangerous, self-chosen venture in war, piling ever more fuel on the camp-fire. I asked him the reason for the conflagration, and he blurted out, without interrupting his good work, 'I have just seen the biggest cougar in Colorado.' Evidently both of us had had the same good fortune.

In the safety of the fire-zone we made a peaceful supper, without venison; and after a final heaping-on of logs, rolled up in our blankets by the fire. In the middle of the night I was awakened by a blow on the chest. I promptly sat up, with the conviction that I was being mauled by the lion. The fire had gone down, and it was very dark. But Funston, who had punched me into wakefulness, whispered hoarsely, 'That cat is prowling around the camp. I have heard it several times. We must build up the fire.'

I strongly agreed, and we soon had another reassuring pyrotechnic effect. Again we turned in, and I was soon uneasily asleep again, only to be wakened by another blow. This time Funston was really excited. 'He's still around,' he said. 'There, you can hear him now.'

I listened intently. I certainly heard something moving off somewhere beyond the piled-up pack-saddle and kyaks on the other side of the smouldering fire. I stared hard in that direction. It was the first gray of a welcome morning. As quickly as the light had faded out of the forest the evening before, it now invaded it. Even as we stared through the cold gray, it became light enough for us to see — our faithful burro browsing on a bit of brush a couple of rods from our bed!

It was a great relief, and we rolled over for a real nap, when from far down the mountain-side came the clear rippling call of a hermit thrush. And then another, higher up, answered, and then another, almost over our heads, and, finally, still another from farther up the mountain-flank. It was the most beautiful, most thrilling bird-song I have ever heard. We lay entranced. And then Funston, sitting up in his blankets to glance around the echoing forest, stretched out again with a grunt of comfort, and murmuring, 'Say, it's damn religious up here,' drew his blankets up to his eyes for the needed nap.

We were boys in those days, and we thought more of new peaks to be won, possible elk and bighorn and bear and deer to be shot at, and trout to be caught, cooked, and eaten, with wild red raspberries for dessert, than of the religion of Nature expressed in her greatness and beauty. But some of this religion did reach us occasionally, and once ours, it has never been lost. I have loitered in the incense-dimmed aisles of many a great cathedral and listened to the rolling of the organs and hypnotic chanting of the priests; but each time I have been reminded of the longer, more fragrant forest aisles and the low repeated rumblings of thunder among the great peaks of the mountain regions I know; and it has been those memories that have given me the greater hope in something still above cathedral towers and mountain summits.

IV

Funston and I had another boys' adventure in the Rockies — this time with a third college mate, now a wise college professor — that I am minded to tell. The three of us, with our long-suffering burro, had started on a rather

longer excursion than usual from headquarters camp, which was to carry us some twenty or twenty-five miles northwest toward the Wyoming line, to an old crater called Specimen Mountain. This crater rose just above a high pass that divided the headwaters of the Cache-de-la-Poudre, which flow first into the Platte, and then into the Missouri, and finally, by way of the Mississippi, into the Gulf of Mexico, from those of the Grand, which, after joining with the Green from Wyoming to make the Colorado, and enjoying much experience of cañon and desert, reach the Gulf of California. In fact, on this pass, which is but a few hundred feet below timber-line, there are two tiny lakes hardly a stone's throw apart, which send their overflow to the Atlantic and Pacific oceans, respectively.

Our way carried us to the bottom and up and out of a long, weird, fire-swept cañon, known as Windy Gulch, with its sides bristling with the stark, gray skeletons of burned trees, and its top leading out on to the broad low summit of the Range, stretching away for a dozen miles or more above timberline to the pass I have spoken of.

On this trip we had our guns, as we always had in those earlier days before the protection of the law had been thrown around the disappearing elk and bighorn. Near the top of Windy Gulch we saw a bear — a rather small bear — lumbering its way toward the summit. We immediately gave chase. The bear turned toward a rock-ridge not far away, and disappeared. But on reaching the ridge we made out what seemed the only hole or cave it could have gone into, and there expectantly awaited the coming-out of the bear.

But it did not come out, and Funston finally made the rather startling proposal that he should crawl into the hole and stir up the bear, which, he argued, would undoubtedly chase him out. We other two were to stand by the hole with cocked rifles, and were to shoot, not at the first thing that came out, which Funston fondly hoped would be himself, but at the second, which would presumably be an irate bear.

After careful consideration of this proposition, entirely generous on Funston's part, as one must admit, Franklin and I finally declined it, on the ground that in our excitement we should be almost certain to shoot at the first creature that appeared from the hole, and if this were Funston, — as it probably would be if he came out at all, — and we should hit him, we should have to answer to his parents. As his father was a Congressman, these parents seemed formidable. Also, if Funston, by any rub of the green, did not come out at all, we should have to help the burro carry Funston's pack back to camp. The final vote, therefore, was two to one against the proposal of the future general.

This Specimen Mountain was a famous place for bighorn; I hope it still is. The wild sheep used to come to the old crater from many miles away, to lick at its beds of green and yellowish deposits; and we rarely failed to find a band of from six to thirty of the wary animals in the crater's depths. In our later trips to the mountain, after the game-protection laws of Colorado were in force, we used to hunt the sheep with cameras instead of guns. The rim of the crater was sharp, and we could crawl up to it from the mountain-flanks and peer over into it, all unperceived. The inner slopes were covered with volcanic ash and broken lava, and great plutonic breccia crags or 'castles' lifted their bulk from various points. By getting one of these castles between us and the sheep, we could work our way carefully down into the crater and fairly near the animals, without startling them.

However, not all the adventures and joys of mountaineering are on or even near the summits. Camp and trail must often be at lower levels, although still truly in the mountains. The trails must lead from wild pasture to pasture — 'meadows,' the mountaineer always calls them; for the pack-animals and riding ones must have good feed each night, to enable them to meet the demands made on them each day. The camps must be made near good water, — a dry camp is a sad thing, — but where there is mountain meadow there is water: there would not be meadow without it. Many of these meadows lie on the successive levels reached in moving up or down the glacial gorges. In the upper *cirques* and gorge-reaches these successive levels carry lakes — wonderful green-blue sheets of cold water set on the wildest and bleakest of rock scenery; lower down there are wet meadows and still lower dryer ones, or bits of forest, but different from the great continuous forest of the mountain-flanks. These meadows are often riotous color-patches, flecked and splashed with a score of kinds of mountain flowers. A stream wanders through them, or, if they are not too level, hurries along with much music. Of course, one can camp in smaller areas, in cañon-bottom, or even on fairly steep mountainsides. One can usually find a few little level spots for the sleeping-bags and fire-irons, or, if necessary, a little terracing work with the spade will make the needed flatness. For you must lie fairly level if you are to sleep at all. Fir branches, old pine-needles, or heaps of bracken help to soften the bed-spots; but you soon get used to the uncovered ground. You manage to fit yourself to its unevennesses.

Besides meadow and water and a bit of level ground, a good outlook is necessary for the best kind of mountain camp. Long views down great cañons, or across them to high peaks, or just straight up along the towering body of wonderful trees, are worth attending to, even for one-night camps. The trees of the Sierras are, of course, alone worth going into the mountains to see. The huge, dinosaur-like bulk of the true 'big trees,' — the sequoias, — and the straight towering sugar-pines, incense cedar, yellow pine, and red fir, make the Sierran forests incomparable. How John Muir loved these trees and lived companion-wise with them! Mountain sculpture, the work of ice, and the great straight trees, were his first interests in the Sierra Nevada.

There is something so different, so remindful of older earth days, when fauna and flora were strange, in the sequoias, those relics of forests that are gone, that they impress me uncomfortably. They do not seem to belong to this time. They can have no companionship with the pines and firs and cedars, which live so congenially together. Their day is past; they must feel sad to linger on.

The trails seem to run most deviously, but mostly they run wisely. They must avoid too bad places and too much steepness; but they must get on, and if the objective is high, they must sometimes climb even steeply, zigzagging up, and they must not go too far around, even if they have to take to rough places or skirt dangerously along cliff-faces. They are most delightful when traversing the forests, for then they are cool and springy underfoot. They are most impressive when they run along the sides of great cañons or on cliffy mountain-flanks. They seem to accomplish most when they carry you over high passes. The way up may be very steep and rough, and the way down long and hard on the knees, but the actual crossing of the pass is a triumph. You see both ways down into

great watersheds; one may have a very different aspect from the other. You see innumerable near and distant peaks. At your feet are wonderful little green glacial lakes, cupped in the great *cirques*.

The surpassing trail-triumph is to put yourself and pack-animals over a 'new' high pass, that is, to be the first to cross it with pack-train.

We did this last summer in trying to get out of the Kings River watershed into that of the Kern by a shorter way than the usual ones. Some Sierra Club men, making knapsack trips around the headwaters of Roaring River on one side of the Great Western Divide, and the Kern-Kaweah on the other, had suggested in the Sierra Club *Bulletin* that it might be possible to cross the Divide with animals through a notch in it about 12,000 feet high, a short distance south of Milestone Peak. Sheep men with their flocks had undoubtedly occasionally used this pass, for there were indications of sheep-trails leading up to it on both sides. But sheep are more agile than mules and horses carrying packs of a hundred pounds and more. However, we had a sturdy lot of animals, with two packers in charge, willing and even anxious to make a venture. So we worked up without a trail, and with considerable difficulty, out of Cloudy Cañon, to a high level camp (10,500 feet) by the side of a beautiful glacial lake not indicated on the Geological Survey maps, and hence unnamed and officially unknown.

Part of one day was given to spying out a possible way up to the pass, and 'making trail' to the extent of indicating by stone ducks the most feasible way to be followed, and throwing some stones out of the way, and strengthening loose and bad places by piling up rocks by their sides. The next day, with one man in front to guide and the others scattered among the pack-animals to lead and urge, we started up slowly, and, with much care and many stoppings to work further at dangerous bits of trail, we won our way to the summit. We were rightfully very proud, and left a record of the winning of the pass in a stone cairn at the top. What needs now to be done is for Forest Service men, or National Park men (if the proposed lines of the new Roosevelt National Park are finally adopted), to make that a really available pass. Then Kern Cañon can be reached from Kings Cañon — or *vice versa* — in two days less time, and by a much more interesting trail, than now.

It is remarkable how effectively even the unexercised human body responds to the call of the trail to cover miles and make altitude. A distance that would be an exhausting walk on a smooth roadway becomes only a fraction of a day's inspiriting jaunt up and down over steep mountain trails. Lungs and heart and muscles seem to meet the need on call. You wonder at yourself as you count up in the evening, after dinner, how far you have come and how high you have climbed. I can't explain it; it is one of the pleasant secrets of the mountains.

But this paper, like the mountain trail, must reach its end. Its objective is simply one of suggestion. If you are surfeited with swift motor-riding; or tired of endless golf; or impatient with having the world too much with you, take a dose of American mountaineering. Go where the highest mountains are, the greatest cañons, the biggest trees. Get a camp cook, — though you will want to be trying your own hand at his game all the time, — an experienced packer, and a train of mountain-wise pack-animals, sleeping-bag, camp-supplies, and a sheaf of U.S. Geological Survey contour maps, — 'quadrangles,' they call them, — and take to the trail. Once out, you will not come back until you have to. And you will go again.

LYRICS

BY JEAN KENYON MACKENZIE

I

She was the little wind that falls
Before the falling of the rain;
She was the one and early star
We lose and see and lose again.

She was the pang of the caress
That is too brief for our delight;
She was the torch another bore
And passed us in the night.

II

If you should say,
'Who goes there?'
Then I would say,
'You go there —
It's your hand at the door
And your foot on the stair
Of my heart every day
And everywhere.'

Then you would say,
'It is long since I passed.'
And I would say,
'It is year before last
Since you went on your way,
But I still hear you there
In my heart every day
And everywhere.'

The Independent
and
THE WEEKLY REVIEW

F. W. K. A1.
See also editorial
Best wishes J.W.D.

Disarming the Conference

The Generalship of Hughes in the Campaign of Practical Idealism

Industry's Stake in the Cloak Strike

Organized Labor's Resistance to Adequate Production is the Real Issue

Vernon Kellogg's First-Hand Account of Relief to Russia

Social Reform and Notoriety

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manufacturers presented the resolution for piece-work, reduced wages, and longer hours, which was published on October 26. After the publication of the resolution there was another meeting of the joint commission, at which the Union chairman charged the manufacturers with breaking the agreement. The manufacturers denied this, saying that there was still time for the commission to act, and that, if the commission would take any action to forward the discussion the Manufacturers would postpone their purpose of putting piece-work into effect. The Manufacturers asked the Union members to join them in making some report to the full conference on November 1—even two opposing reports signed by the opposing halves of the joint commission—so as to bring the issue before the joint Union-Manufacturers' conference which had created the commission. The Union members refused to make any sort of report, saying that instead they would issue a public statement charging the manufacturers with breaking the agreement.

If this view of the facts is correct (and it appears to be) it seems to the writer that the question of whether the manufacturers broke the agreement is academic and unreal. The Union had previously broken both the letter and the spirit in a most vital way. Faced by a revolt against their attempts to discipline for underproduction; with nearly half of their members out of work; and with their grip on every branch of the garment industries weakening, the Union leaders seized the first excuse for declaring a general strike in order to strengthen their own position. In the slang phrase, they beat the manufacturers to it. The manufacturers did not want a strike until after they had finished their work for the winter season. That is why they set a date for introducing piece-work (November 14) practically at the end of the season. If the Union had not previously broken the agreement, the publication of the manufacturers' resolutions before it could be known that November 1 would see no report from the joint commission would have been a clear breach of the spirit of the agreement. As the case stands, the writer sees less a breach of the agreement than an amazing absence of ordinary common-sense on the part of the manufacturers. By a mere delay of six days in publishing their resolutions they could have avoided the greater part of the public condemnation that has been visited upon them, and could also have deprived the Union leaders of their present excuse for a general strike.

That the economic burden of week work as enforced by the Ladies' Garment Workers is dissipating the industries on which these workers depend is well known to the informed. The New York dress industry, which had a contract with the Union a year ago, escaped from it in the dull times of last winter. The manufacturers, fearing week work, largely shifted to a jobbing basis on which the so-called manufacturer (really a jobber) has all the work done by contractors, by sub-contractors, and by small independent shops. This has so subdivided the units that effective control by the Union is practically impossible. A similar process is under way in the cloak industry. Further, the field of Union control has been invaded and split by hundreds of so-called "social shops"—small shops on a piece-work basis where workers earn as much or more than on week-work, and *have jobs* while many of their week-work brethren are out of work. The general effect in the cloak industry is in the same direction as in certain branches of the leather-bag trade, where excessive and uncertain labor costs under the week-work system as here practiced have within a brief period driven the greater part of that industry out of the city.

Nothing else exposes so clearly the fighting, anti-coöperative, and obstructive policy of the New York locals of the International Ladies' Garment Workers' Union as the exactly contrary policy of the Cleveland locals of the same organization. To turn from New York to Cleveland is, indeed to turn "from Philip drunk to Philip sober." Superliberals who may distrust facts coming through any other medium are advised to read in the *New Republic* for November 16 an excellent general sketch of the Cleveland plan, written by William J. Mack, resident impartial chairman under the Cleveland agreement. That article explains how the Cleveland unions are carrying out an agreement with the manufacturers there to

(1) Prevent strikes and lock-outs;
(2) Settle all disputes ultimately through an impartial judge;
(3) Establish production standards under the week work system;
(4) Provide increasing wage rates for production above the scientifically set standards;
(5) Provide a minimum of 40 weeks' employment a year.

Of actual results in Cleveland the *New Republic* article says:

> The increase in efficiency and the decrease in waste, where standards are in effect, has resulted in an increase of from thirteen to thirty-seven per cent. in the earnings of the workers and a decrease of from nineteen to forty-two per cent. in the unit production cost to the manufacturers.

"Industrial Statesmanship" is the appropriate title of the *New Republic* article. Complete absence of industrial statesmanship rules the policy of the New York unions. The Cleveland scheme measures up to the high standards set by the Hoover Committee on Waste in Industry—it served that committee, in fact, as one of the foremost examples of waste elimination. Mr. Schlesinger, president of the International, has a personal prestige so great that he could if he would, ultimately swing his people into a sane and profitable attitude of coöperation for the good of themselves, the industry, and the public; but as he has always shown himself a militant opportunist of the traditional Federation type, this is not to be hoped for. He has opposed the Cleveland plan and the leader of the Cleveland unions, even deposing him from office only to see him informally retained and paid a salary by the loyal Cleveland workers in defiance of New York's disapproval.

If the strike establishes in New York the present week-work system, it will almost inevitably mean the disruption of the Cleveland plan, and therewith the breaking up of one of the most promising advances in the entire industrial field. That plan stands for the greatest practicable wages and security for the worker, based on an efficient, measured production that is the only possible foundation for a prosperous industry. Every man whose eyes are really open sees that adequate production and friendly coöperative relations between workers and employers are indispensable to our economic and social welfare. If that issue loses in the garment strike, who wins?

Piece-work and its alleged evils need a word of comment that must here be brief. In the New York garment trades there is no such thing as "an autocratic fixing of prices by the employer." For years past piece-rates have been set by bargaining between each employer and a committee elected by his workers. Under this system, between 1910 and 1919, the coöperation of the Union and the manufacturers through the Joint Board of Sanitary Control abolished the sweat-shop. The sweat-shop issue is a dead issue. Every other evil charged to piece-work in recent newspaper editorials has been met and obviated through coöoperation of unions and employers in the men's clothing industry of Rochester, and in other places.

As a bit of ironic comment on the attitude of the garment unions, whose members are ardent professing partisans of Soviet Russia, comes this perfectly authenticated bit of news:

The workers in control of the Russian Soviet industries have of their own motion put their plants on a piece-work basis, as the only possible way to get adequate production.

Hungry Russia

The American Relief Adminstration Sets to Work

By Vernon Kellogg

WHAT is the truth concerning the Russian famine? Are all the newspaper accounts of it true?

I have had the unhappy privilege of seeing and hearing at first hand something of the situation. Although my recent visit to Moscow and the Volga region was a short one, I had unusual opportunities to come close to the burned fields and to the suffering people. And I have had a considerable experience ever since the beginning of the war in Belgium, North France, Germany, Poland, and Austria, all of them sufferers from food shortage, which gives me some competence to get rather quickly at the truth of the situation in a region of alleged famine.

International

Starving children at Samara being examined on a hospital train

Well, while I am not prepared to vouch for the truth of all the details of horror which have been published, there is not the slightest doubt that a famine of awful magnitude does exist. It is a truly dreadful situation, and one that appeals irresistibly for amelioration, whatever the cause and whosesoever the responsibility. Help is imperatively demanded from a humane world.

Let me give a few facts from personal observation. One of the most conspicuous and distressing scenes that meet one's eyes in the Volga provinces, and even before reaching them, is that of the refugee camps and trains. Men, women, and children, with their clutched-up bundles of bedding and smaller household goods, are gathered in shivering groups of hundreds to thousands along the railways and on the banks of the Volga waiting to be carried away to the North, to Siberia, to Turkestan, to anywhere outside the land of famine. Long trains of freight cars loaded with these unfortunates move slowly and irregularly. The lower decks of the Volga boats are crowded with them. Howls and cries and fighting among those intent on getting into already overloaded trains and boats fill one's ears at every station.

Now these fugitives are by no means exclusively the poor from the towns, the workless workingmen without money to buy what food the markets offer, but are largely composed—I have talked with many in many camps and crowds and know this—of the peasants directly from the farms and farm villages; the very people who produce the food, when it is produced, and who therefore always have food when there is any food. It is the most certain evidence one can have of the reality of the drouth's effect. Besides, one can see for oneself miles of grain fields in the Kazan, Simbirsk, and Samara provinces in which no attempt at all at harvest had been made.

Another item of evidence. The statistics of grain acreage and production for all the years from 1912 to 1921 which have been collected by the American Relief Administration men now on the ground reveal clearly the gradual agricultural decadence of the great Volga basin since the beginning of the war, and show how this has increased since the beginning of the mistaken Soviet Government policy of requisitioning food surplus. I have the figures for Samara province now before me. From an average annual acreage of the four grains—wheat, rye, oats, and barley—of about two and one-half million dessiatines in pre-war years, the acreage in 1920 and 1921 had decreased to one million. From an annual production that averaged 120,000,000 puds before the war there was a fairly steady decrease to 18,000,000 in 1920 and a great break (the drouth) to 3,000,000 in 1921. These figures in themselves would show how great is the suffering from lack of food.

A final item, final only because I must respect my space

International

Dr. Kellogg inspecting a group of little famine victims

limits. The Soviet Central and Provincial Governments have tried to do something by way of bringing food from other provinces into the stricken region, and a special effort has been made to care for the children. There are about fifteen Children's Detention Homes in Samara city, and about the same number in Kazan. I visited—horrible experience!—some of these homes. In one—not the worst—I arrived at the time of the noon meal. A hundred little ones with shaved heads—protection from the typhus-carrying lice—were sitting on the bare floor of a large room, leaning against the walls or against each other, all emaciated and many with the bloated "hunger belly."

The meal was of horsemeat—the peasants are killing and selling their farm animals—and "kasha," a thick brown porridge of grits. I asked where the children slept. "Here," the haggard, short-haired woman in charge said. "You bring in mattresses and blankets?" I asked. "There are no mattresses or blankets," she replied dully. When I told her that tomorrow, or at the latest by the day after tomorrow, she would have white bread, rice with sugar and tinned milk, cocoa, and some fats for her children, she broke down.

Mr. Hoover's American Relief Administration has arranged to give one good meal daily to 1,200,000 of the starving children in Russia until the next harvest. This is made possible by American private charity. The system of introducing, protecting, preparing, and distributing the food is exactly the same as that which the Administration has developed and used in all the other countries of Eastern Europe. The Soviet Government has, up to date, given a complete coöperation. No single incident of attempted seizure or diversion of the food has occurred. Protection has been adequate. We have had a priority in transportation. The Americans go everywhere necessary, talk with anybody, build up their local committees, and choose their helping personnel without interference from central or local Soviet authorities. The food is in the sight and control of the Americans from the time it enters the country until it goes into the children's mouths.

But besides the hungry children there are the hungry mothers and fathers. The American Relief Administration has no resources available beyond those sufficient for the 1,200,000 children. There are really nearer five million than one million who need help. If it finds that it can do more it will simply take on more children.

But it has devised a means whereby others can, through it, help any relatives or friends or even any sufferers unknown to them in Russia. It has instituted a system of "food remittances," much like the "food draft" system used by the Administration for other European countries, whereby anyone, by the payment of $10 (or more, in units of $10), can have that value in food—purchased at wholesale in America—sent to Russia at lowest transportation rates, and delivered at any of the many Relief Administration warehouses now established in Russia. The transaction is completed by the beneficiary, who presents a remittance card. Or the bearer of the card, if too far from a warehouse, can have the food sent by Russian parcels post. Special arrangements have been made for a reasonably prompt and safe delivery by mail.

One thing is to be remembered. Out of the food which the $10 will buy one-fourth is taken possession of by the Relief Administration to be added by it to the amount of food available for free distribution to the children. Even with this subtraction the $10 will ensure the delivery in the heart of Russia of as much and as good food as you or I can buy at retail for $10 in New York City. The "food remittance" arrangement is devised to help both adults and children simultaneously. Applications for food remittances accompanied by the money may be made directly to the American Relief Administration, Food Remittance Department, 42 Broadway, New York.

Many readers of *The Independent and The Weekly Review* will perhaps be especially interested in the present situation of the university and professional men, the "intelligentsia," of Russia.

For a long time after coming into power the Soviet Government maintained a seriously discouraging attitude towards the university faculties and the professional and scientific men in general—the "intelligentsia." But this attitude is now modified and is showing steady improvement. The change is in line with the altered attitude towards business and general economic matters.

The salaries, paid in paper rubles of constantly depreciating value—they are now worth about 75,000 to the dollar!—were very low, becoming, indeed, as the value of the ruble decreased, simply derisory. But more important, in Russia, than any salary paid in money—unless it get into millions of rubles a month—is the "paiok" (I spell it as pronounced), or food ration, that is the essential part of the reward for services to the Government. As is familiarly known, the Soviet Government established several grades of ration according to various categories into which the people could be roughly divided. The workingman got the largest or best ration; the university man nearly the lowest.

In my visit to Russia I learned something at first hand of the changing situation of the university and professional men of the country. I was not in Petrograd but saw a number of faculty men in the universities of Moscow, Kazan, and Samara. Samara is one of the several new universities (?) set up by the Soviet Government. It has four faculties—medicine, law, agriculture, and "workers." The "workers faculty" offers elementary classes for the sons and daughters of workingmen and peasants to fit them for matriculation in the professional departments of the university.

The salaries and "paiok" of the professors in the University of Kazan had been so meagre that not a man was able to live on them, and every professor was meeting his family's needs for food by doing something besides regular university work. The means for keeping himself and family alive were various, but in almost all cases they included the successive sacrificing of personal and household belongings. One professor of biology told me that he made shoes, and that his wife baked little cakes and sold them in the city market. He had sold all of his own and his wife's simple jewels and trinkets and one of his two microscopes. Yet this man, who has not been able to see any books or papers published later than 1914, has struggled along with his special researches and has actually achieved two pieces of experimental work on vitamines which seem to me, with my little knowledge of the subject, to contribute certain definite new knowledge concerning these interesting substances.

But, beginning in August, there had been a material increase in salaries and in food rations. The monthly food ration had in August been put on the following basis: dark (mostly rye) flour, 30 lbs.; dried peas, 5 lbs.; cereal grits, 15 lbs.; sweets (not cane or beet sugar), 2½ lbs.; tobacco, ¾ lb.; butter, 6 lbs.; meat, 15 lbs.; fish, 5 lbs.; tea, ¼ lb.; white flour, 5 lbs. The items from dark flour to tobacco, inclusive, had been received; the rest of them, promised but not received. About 250 professors and instructors receive this ration. The university buildings are so cold that most of the men do all their work except lecturing in their homes. About 5,000 students had registered, but only about 10 per cent. of them were in actual attendance. The largest departments in point of student enrollment were medicine and science. About twenty men of the Kazan faculty have died in the last two years.

International

At a refugee camp

EDITORIAL

Disarming the Conference

The Generalship of Hughes in the Campaign of Practical Idealism

ACCORDING to the hackneyed phraseology of the Washington correspondents, Secretary Hughes in his opening address to the Conference dropped a bombshell among the delegates. It would be more accurate to say that he disarmed them. The presentation, at the very outset of the Conference, of a concrete programme which included sweeping reductions and a long naval holiday, was a bold move, but it was clever and effective strategy. The surprise with which it was greeted by the delegates was not simulated, though it must be assumed that as far as the British and Japanese were concerned, the element of surprise lay not so much in the content of the proposal itself as in the time and manner of its presentation. It is scarcely reasonable to suppose that the American delegation would assume to lay down such a detailed programme for our neighbors without first consulting with them as to certain features that specially concerned them. Some tentative understanding with each of these two Powers must have been arrived at previously by private negotiation. What was unexpected was that the substance of these understandings, or something approaching it, was thrust upon the Conference in concrete forms as a line to which to hew, as a standard to which no one could take exception, at least on the side of narrower limitation, without incurring the onus of obstructing the prime object for which the Conference was summoned.

The line of reasoning that determined the course of Secretary Hughes is not difficult to surmise. No one realizes better than he that an adjustment of the respective interests of the three Powers in the Pacific is a *sine qua non* of the acceptance of any programme of limitation of naval armament. No one understands better that certain complex Far Eastern problems must be solved before any one of the Powers concerned will agree to a radical change in its naval strength, since any such change must answer to the removal of the corresponding causes of armament. But he also was aware that to start the Conference off on the discussion of Far Eastern problems was to precipitate unlimited debate that would undoubtedly confuse the main issue and possibly render the whole meeting futile. Further than this, it was hardly within the province of the United States to propose offhand a concrete Far Eastern programme, and merely to set forth some obvious and fine-sounding abstract general principles would get nowhere.

The stage was perfectly set. Not only had an atmosphere of mutual confidence and common purpose been established among the delegates, but far and near the peoples whom they represented were looking to the Conference with earnest hopefulness. A weary world was waiting impatiently for definite results; to have wandered off into a welter of discussion or to have approached the task with the enunciation of abstract formulas would have brought disappointment and disillusion. The example of another great conference is too recent not to bring painful memories. The straight-from-the-shoulder blow of Secretary Hughes was therefore a master stroke. The popular response throughout the world was immediate and enthusiastic and the last words of the memorable speech had scarcely been uttered before every delegate realized that to oppose the programme, a programme in which America herself set the pace of magnanimity, would be to invite popular dissatisfaction and repudiation at home. At a single blow, the Chairman had disarmed the Conference of all possibility of proposing a programme less sweeping and drastic, or of interposing obstacles that savored of selfishness or disingenuous expediency. Modifications, if any, must lean to the side of greater rather than less limitation of naval armament.

Not less interesting, if less important, was the bombshell dropped into the midst of the camp of the numerous well-meaning but silly folk that had gathered to coerce the Conference into disarmament. It left them gasping for breath, weaponless and perhaps somewhat abashed. We paid our respects to these *saboteurs* of the Conference in a recent number. Some good people seemed to be laboring under the fear that the statesmen representing America might be weak-kneed on the matter of limitation of armament; that their hearts were not really in the great cause. As usual there were plenty of glib talkers with ready-made formulas and programmes who were of course—at least in their own estimation—much better fitted to carry on the negotiations. But now their thunder has been stolen and they are disconsolate.

Following closely upon the opening surprise of the Conference was the unexpected proposal by Mr. Sze of a programme of ten points for the settlement of the Chinese question. China is recognized by all as the fundamental problem with which the Conference has to deal, and it is a problem so complex and difficult that it will tax the delegates to the utmost to find a satisfactory solution. Mr. Sze's points are general in character and pretty well cover the field. The principles he sets forth are reasonable and accord with American policy and practice. He asks for the reaffirmation of the open door principle, respect for territorial and administrative integrity, prohibition of secret treaties relating to China, the reconsideration of other treaties and engagements, and conferences from time to time for the discussion of Far Eastern interests. The New York *Tribune* notes with disappointment that in confining himself to general principles, he omitted the important, and even vital points of Chinese control over interior communications, tariff autonomy, and the scrapping of old treaties which forbid China to make any tariff changes until consent is obtained

no good reason why, for instance, the blacksmith working in a railroad shop at Scranton should be given a preferred status over a blacksmith working in a private plant in the same city nor why the Scranton railroad blacksmith should be paid exactly the same wages as railroad blacksmiths in Tampa and Albuquerque. All these men are, or may be if they wish, represented by the Blacksmiths' International. Workers in the half-dozen or so other shop crafts similarly have their own special organizations. Yet the railway department of the Federation of Labor exists for the sole purpose of securing special wage and working advantages for these men, not because they produce transportation, or are individually indispensable to transportation, but merely because they are employed by railroads, and the railroads—at present—can't help themselves. The special advantages secured under the national agreements for these crafts are a disturbing element in local industrial fields all over the country, and an unnecessary and unjustifiable burden on transportation costs. We believe that special government-ordered favors to the shop crafts, the clerks, and the maintenance-of-way laborers, creating as they do artificial competition in the labor fields all over the country, are economically without justification.

The Life-Line of the A. R. A.

IN our issue of last week we printed a letter from a resident of Petrograd which gave a more vivid picture of that city of desolation and despair than can be had from many pages of description by newspaper correspondents, for it came not from an observer but from a participant. The value of this letter, however, lay not so much in the information it contained as to the terrible conditions that prevail in the unhappy city, or in the appeal that it makes to our sympathy and compassion. What stands out is that the writer had just received the sum of five dollars, a fortune that spelt relief from the terrible pangs of hunger and cold for weeks and even months. It is no wonder that his first thought was to express his deep gratitude to the donor.

Our minds turn at once to the latest diplomatic achievement of the American Relief Administration in Russia. Thanks to the successful negotiations of Dr. Vernon Kellogg, Mr. Hoover's faithful co-worker from the beginning of the Belgian Relief, the Soviet Government has permitted the extension of the institution of the food-draft to Russia. This was not readily conceded, for the Bolsheviki viewed it with great suspicion. It could be used by people outside Russia to aid the very persons who were least sympathetic to the Soviet régime. Indeed the Soviet leaders are frank to say that while on the one hand the A. R. A. is their benefactor, on the other it is their greatest enemy. The operations of the A. R. A., carried out through non-political committees of their own choosing, are at once evidence to the people that there is a happy land outside Russia not swallowed up in revolutionary misery as described to them in the Bolshevist propaganda, and an object lesson in efficiency and organization in glaring contrast to the Soviet conduct of government.

The food-draft arrangements of the A. R. A. provide that anyone wishing to do so may send to any person or group of persons in Russia an actual package of nourishing food and be sure that it reaches the consignee safely. The A. R. A. accepts payments for this purpose of $10 or multiples of $10. Food packages are not sent from here but are made up in the A. R. A. warehouses in Russia, a vastly more economical proceeding. One-quarter of each remittance is deducted by the A. R. A., a sort of commission and transportation charge as it were, and this is devoted to the feeding of children. But the saving effected by shipment in bulk is such that for $10 the donor can furnish as much food to the recipient in Russia as he could buy at retail for the same money in America. Forms are provided by the A. R. A., 42 Broadway, New York, containing the necessary instructions. If the consignee is not located in ninety days after sending, the money is returned.

We have described this new work of the A. R. A. thus in detail because it has occurred to us that it contains a possibility hitherto overlooked and one that will appeal mightily to many of our readers. One's first thought of the food-draft is that it affords a means whereby Russians in this country can aid their less fortunate relatives and friends. But it opens up other possibilities. Scarce one among us but has at some time enjoyed the beauties of Russian art and literature and music or profited by the achievements of the great Russian scientists. Now hosts of the gifted artists, writers, musicians, and scientists are starving in Russia and a food-draft to one of them would preserve him and his usefulness to humanity. What could be finer at this Christmas time than to express the gratitude one feels for pleasure and profit given freely in the past by throwing out to one of these the life-line of the A. R. A.?

Home Ownership and Housing Shortage

THERE is an Oriental saying that divides men into four classes—the man who knows and knows that he knows, the man who knows and doesn't know that he knows, the man who doesn't know and knows that he doesn't know, and the man who doesn't know and doesn't know that he doesn't know. The fourth class is the worst—and unfortunately it is also the most numerous. Whoever can shift a goodly part of this multitude from the fourth class into the third is a public benefactor. In regard to the housing problem, that is the first thing which Mr. Hoover aimed to do in his recent letter addressed to the New York State Realty Convention. Instead of directing attention to a few sensational features of the housing situation—often sensational, by the way, only in outward appearance, and becoming quite natural when fully understood—he insists upon a concrete ascertainment of facts as the first condition of effective action. "The problem," he justly says, "varies with every community and must be based on a primary accurate survey of the conditions in that particular community":

> In all communities there is a failure to agree upon facts. Some maintain that money is not available, some that no shortage exists, some that buildings cost more than twice what they did before the war, others that they cost not over 50 per cent. more. Before any progress is made it is necessary that the facts be determined, and to do this it is essential that a survey be made by the different elements of the population.

from some fifteen different nations. These points, however, will undoubtedly receive careful attention in the discussions that will follow.

The important fact is that a comprehensive programme has been presented *by the Chinese representative*. Here again we seem to have an example of the excellent generalship of Secretary Hughes. The first impression created appeared to be that of annoyance, something amounting almost to resentment that the Chinese should thus assume to instruct the Conference. China has for so long been an object rather than a subject of European concern that such self-assertion seemed out of place. Doubtless many a delegate felt like exclaiming: "Children should be seen but not heard!" But it is reasonable to suppose that the Chinese delegates would not wittingly take any action that would cause embarrassment to the United States. These delegates are able and clever men, they know America well and count upon America as China's friend and supporter. It may be taken for granted therefore that their action in thus boldly presenting China's case was not unadvised. It was, in fact, first-class strategy. The American delegation could not propose a programme on the Chinese question; it would come ill from us, who have acquired no territory or special interests at the expense of China, to make a proposal that would savor of accusation of those who had in the past followed a contrary policy. A proposal from Japan would have been viewed with suspicion, even if Japan had been willing to suggest a self-denying ordinance of sweeping character. Indeed rumor has it that the Japanese had already prepared a programme which proposed the Great Wall as the northern limit of China's sovereignty, and they were forestalled in this by the prompt action of the Chinese delegation. In short, no more satisfactory way for bringing the main problem before Conference could have been found than for the Chinese themselves to state squarely and firmly the issues involved. Salvation for China must come from within; no matter what her present difficulties and disorganization, she can not become the permanent ward of the other Powers. Sovereignty, it is true, is a matter of degree and the limits of territorial integrity and administrative independence may be open to discussion, but the programme proposed by Mr. Sze and his colleagues not only gives the Conference a working basis for their discussions but establishes China's position and determines the attitude toward her which must be accepted by the other Powers if any solution other than perpetual tutelage is contemplated.

Progress on Railroad Problems

IN following their request for a further reduction in wages with a 10 per cent. reduction of freight rates on all farm products, the railroad executives have acted with a shrewd appreciation of various aspects of public opinion. The general public may be expected to see in the rate reduction an effort by the railroads to scale their own prices down to reasonable levels, and to carry out in part, even at an immediate loss to themselves, the pledge of the executives to give the public the benefit of further wage reductions. It is pretty clear that the general public recognizes the urgent need of an equal deflation of wages in all industries; and we believe it is pretty widely accepted that railroad wages have not yet contributed their proper proportionate share in the general deflation. In so far as the railroads convince the general public of the sincerity and reality of their promises of lower rates, they are securing public support for reductions of wages.

The farmers of the country represent another and special public opinion on whose support for their wage-reduction programme the railroads are obviously counting. The rate reduction proposed by the railroads is less than the sixteen per cent. cut recommended by the Commerce Commission for hay products, but for practical purposes it more than compensates by its greater inclusiveness, and will secure wide approval from the farmers. If, as seems to be the case, the railroads have the support of the Commerce Commission in making the new rate-cut a voluntary measure subject to recall at the end of six months *if wage cuts are not then assured*, they have apparently given the farmers special reason to watch keenly for evidence of undue delay in wage reductions. If the Railroad Labor Board shows such delay in dealing with wage reductions (feeling bound by Vice-Chairman Hooper's "unofficial" pledges of delay to the Brotherhood chiefs) it is humanly certain that the farmers will bring pressure for prompt action. As between a possible re-raising of rates on their own products and a decrease in railroad workers' wages, it is quite plain which side the farmers will take.

Recent and pending agreements for the establishment of district boards of adjustment constitute another important step, both in hastening the action of the Labor Board on wage issues, and in making an essential and practically very important distinction between the actual *producers* of transportation and the vastly greater number of railroad employees who merely make or repair the tools, or keep the records. The new adjustment boards are not the national boards for which the railroad unions—and especially the shop crafts—contended so persistently last year. They have been set up for many of the roads in the Southeastern district and for the Western; and several roads in the Eastern district are on the point of taking similar action. These new boards are confined to the four older train service brotherhoods, the actual producers of transportation. They will apply to individual grievances not the terms of a national agreement, but the provisions of the agreement in force on the particular road from which the case comes. By probably disposing of a great proportion of the purely individual cases that have hitherto been dumped on the Labor Board, they will do much to remove obstacles to prompt consideration by that Board of the pending wage-cut demands. When the Labor Board has once completed its action on the working rules of the non-transportation unions, disputed cases under those rules are likely to be very small in number in comparison with cases arising under the train service schedules. The new adjustment boards therefore will do much to clear the way for the main issue of wage reductions.

It is improbable, and we think it undesirable, that the railroads should extend the recognition of adjustment boards to the shop-craft and other non-transportation unions. From the point of view of the welfare of industry and the just rights of labor we see

It is therefore probable that the concentration of hydrogen ions of the soils has a direct rather than an indirect influence on the constitution of the vegetation.

CARSTEN OLSEN

THE CARLSBERG LABORATORY,
COPENHAGEN

THE PRESENT STATUS OF THE CONCILIUM BIBLIOGRAPHICUM

PROFESSOR HENRY WARD'S appreciative account of Dr. H. H. Field and his self-sacrificing work in connection with the founding and maintenance of the Concilium Bibliographicum suggests to me to make a brief statement concerning the present status of the Concilium.

I spent several weeks in July and August of this summer in a personal examination, in Zurich, of Concilium affairs, representing the National Research Council and the Rockefeller Foundation. The Council has had for some time, during the latter months of Dr. Field's life-time and since his death, in consideration the possibility of extending some aid for the maintenance and further development of the Concilium. The Foundation has manifested a similar interest with a tangible expression of it by two appropriations to assist in meeting the current expenses of the Concilium in 1920 and 1921.

On arrival in Zurich I found Concilium matters in a critical situation. Dr. Field's patriotic activities during the war had left him but little time to devote to the Concilium, and the disastrous results of war-time and after-war conditions on such international organizations as the Concilium had left things in very bad shape. Dr. Field's sudden death prevented him from even beginning a serious rehabilitation of Concilium work and finances.

After many conferences with Mrs. Field and her business friends, with Fraülein Rühl who for twenty years has been Dr. Field's chief technical assistant and was practically the only member of the Concilium staff still giving full time to its affairs, and with an official representative of the Swiss Natural Science Association, which under the terms of Dr. Field's will becomes, under certain conditions, the legatee of Dr. Field's financial interest in the Concilium, and after long and difficult examination of the business books and memoranda of the Concilium, I arranged to set up a provisional reorganization of the Concilium under the acting directorship, until January 1, 1922, without salary, of Professor J. Strohl, of the Zoological Institute of the University of Zurich.

This temporary reorganization will allow some of the most needed work of the Concilium to go forward, supported financially by the subsidies of the Swiss Government, the city of Zurich and the Rockefeller Foundation.

The Concilium, which from the business point of view, is a non-profit taking company, most of whose shares belong to the Field estate, owns an equity of some value in the building at 79 Hofstrasse which for several years has been the Concilium offices and printing rooms. It also has some assets in the way of many already printed cards, some little stock of paper, some office furniture, type and printing presses, etc. But most importantly its assets are its "good will" and subscription list. This list must have immediate attention and revision and that is part of the work now being done under the provisional arrangement.

Professor Ward and other American biologists may be assured that the Concilium is not being allowed to go to pieces without some positive efforts being exerted to save it. It is not yet time, but soon will be, for a definite statement to be issued to the American subscribers to the Concilium cards, which, I hope, will not have to include a direct appeal for money for the support of the Concilium but will appeal for a renewed interest in, and support of the organization, to be manifested by a confirmation of old subscriptions and an addition of new ones. I was much interested to discover from examination of the subscription lists that one third of all the Concilium subscribers are American.

VERNON KELLOGG

NATIONAL RESEARCH COUNCIL

SCIENTIFIC EVENTS

THE HIGH ALTITUDE EXPEDITION TO PERU

As has been already noted in Science, the Royal Society High Altitude Expedition to Peru sailed in the third week of November on the *Santa Teresa*. The expedition proposes to study the adaptation of man to life at or above the altitude of 14,000 ft. As compared with other localities in which this type of work has been carried out, Peru possesses certain advantages: (1) Being near the equator, the effects of altitude are less complicated by those of cold than in higher latitudes. (2) The Central Railway of Peru, the highest standard-guage railway in the world, ascends the Andes to an altitude of 15,885 ft. (3) A mining population lives and works in localities situated above 14,000 and 16,000 ft., or even higher. It is alleged, for example, that the porters at the town of Cerro de Pasco, in the Andes, raise the ores 600 ft. from the mines by carrying loads of 160 lb. of mineral many times in the day. There is probably no other population which carries on such heavy work in so rare an atmosphere. Experimental methods for the study of the circulatory and respiratory systems have advanced so much within the last ten or twenty years that the time seems ripe for their application to the extraordinarily interesting problems which life at high altitudes presents. Donations towards the expenses of the expedition have been received from the folowing: The Royal Society, the Harvard Medical School, the Carnegie Fund, the Moray Fund, the University of Toronto, the Rockefeller Institute, the Presbyterian Hospital, New York, Sir Peter Mackie, and Sir Robert Hadfield.

Members of the party are Alfred C. Redfield, assistant professor of physiology at the Harvard Medical School; Arlie V. Bock, M.D., of the Massachusetts General Hospital; Henry S. Forbes, M.D., now engaged in research work in industrial medicine at Harvard University; C. A. L. Binger, of the Rockefeller Institute, New York; and George A. Harrop, of the Presbyterian Hospital, New York. The expedition was organized by Joseph Bancroft of Cambridge University, England; he is accompanied also by Professor J. G. Meakins, of Edinburgh University, and Dr. Doggart of King's College, Cambridge, England. They carry with them an X-ray machine and a large amount of other medical apparatus.

After completing the studies at Cerro de Pasco, the investigators expect to spend a short time at Ticleo, on the watershed of the Andes. Ticleo, nearly 16,000 feet high, is the highest standard-gauge railroad station in the world. They will return by February first, and later in the year Mr. Bancroft will give a series of lectures at the Lowell Institute in Boston.

THE JOSEPH HENRY FUND OF THE NATIONAL ACADEMY OF SCIENCES

In the year 1878 a tripartite agreement was made between (1) Certain citizens of Philadelphia, (2) A Pennsylvania Insurance and Annuity Company and (3) the National Academy of Sciences, by the terms of which a fund of $40,000 face value was placed in trust with the Company, the income from which was to be paid to Professor Joseph Henry during his life and after his death to his wife and three daughters and after the death of the last survivor of these four, it was provided that the same gross sum shall be transferred to the National Academy of Sciences to be forever held in trust and the income from which shall be from time to time applied to assist "meritorious investigations in natural science especially in the direction of original research."

By the death on November 10, 1920, of the last survivor of the original beneficiaries, the capital sum passes, as of that date, into the hands of the National Academy of Sciences for purposes as indicated.

At the recent fall meeting of the Academy in Chicago, the following statement of policy of administration, submitted by the special Committee on this fund, was approved by the Academy:

Under the terms of the trust deed there is im-

science. It has been far easier to get funds for types of work which promise early contributions to practice than those which dig deep and lay solid foundations to make the whole superstructure sure. The dependence of the former upon the latter needs to be recognized.

The magnificent work of Armsby and his associates has been the admiration of the scientific world, but in spite of its ultimate practical value, and especially in furthering investigation, it had not within itself the elements of publicity, and was only vaguely understood. It never had an assured permanent income, and in that sense was obliged to live from hand to mouth. The loss this entailed is realized too late; and now the future of the work he so admirably started is under discussion. It would be a calamity if it were allowed to fall to the ground.

The large amount of attention now being given to fundamental and searching inquiry on the soil, the conditions of plant growth, and related subjects, should not fail of mention in this connection, for it illustrates the development of insight into these problems. At no period has there been anything comparable to it. The results which are following from these intensive studies amply justify the expectations of them as constructive means of progress.

With all the facts clearly in mind, it is very important to take an account of stock in the more conventional lines of experiment; to study seriously the long list of the better experiments in order to determine what they have actually shown, what they are competent to show, and the lessons they teach in methods. By all means, let us garner in all the teachings of these field and other common types of experiment; let us profit by both the good and the bad experience, but let not the negative results be overlooked in searching for the more positive ones. Such experiments represent large annual expenditures, and they occupy the time of a large body of workers. They express a confidence on which men are staking their efforts and their prospects. It is important to know the place which such experiments should occupy in future study and the manner in which they need to be supplemented. This may be one of the fundamental lessons to be drawn from them, and may indicate that their most useful field is in supplementing laboratory studies, rather than the reverse as at present.

In a public supported enterprise like agricultural investigation there must necessarily be a happy combination of effort representing different grades of intensity. Some problems or stages of them call more urgently for the full measure of the method of science than others, and it will be for the investigator to govern himself accordingly. But he can not fail to exercise a critical attitude toward all his work and his methods, or to exemplify in them the element of real progress.

E. W. ALLEN
U. S. DEPARTMENT OF AGRICULTURE

THE CONCILIUM BIBLIOGRAPHICUM

IN the issue of *Science* of December 2, I called attention to the critical situation in which I found the Concilium Bibliographicum this summer, when I made a special trip to Zurich to investigate this situation for the National Research Council and the Rockefeller Foundation.

On the occasion of this visit I proposed, after conferences with Mrs. Field (widow of the late Dr. H. H. Field), her business advisers, the chief of the technical staff of the Concilium, and official representatives of the Swiss Natural Science Association, which becomes under Dr. Field's will the legatee, under certain conditions, of Dr. Field's financial interests in the Concilium, a plan for an immediate temporary reorganization of the Concilium to last until January 1, 1922, and a further plan for a provisional permanent reorganization to go into effect as from that date.

The plan for temporary reorganization was put into effect immediately with Professor J. Strohl, of the Zoological Institute of the University of Zurich, as acting director, without salary. The proposed provisional permanent reorganization—by "provisional permanent" I mean a well considered and fully supported organization to run on until international mat-

ters may indicate a desirable change—required, for putting into effect, the approval and definite action of the Field estate, the Swiss Natural Science Association, the National Research Council, and the Rockefeller Foundation. I obtained the formal agreement of the Field estate and Swiss Association before leaving Zurich and now the Research Council and the Rockefeller Foundation have signified formal approval and taken the necessary definite action.

This arrangement, which would require too much space to set out in detail here, provides for the control of the Concilium, until some later arrangement for control by a satisfactory international board can be made, by a special Commission set up by the Swiss Natural Science Association on which there shall be an official representative of the National Research Council whose acquiescence must be obtained for any major activity or expenditure of funds proposed by the commission. In addition, the National Research Council sets up a special committee on Concilium matters to advise and instruct the Council representative on the Swiss Commission. This committee of the Research Council is composed of Drs. R. M. Yerkes and L. R. Jones, and myself as chairman. I am also appointed as the Council's representative on the Swiss Commission.

To clear up the current obligations of the Concilium and help maintain it during the next five years the Rockefeller Foundation has appriated and pledged to the National Research Council the following sums: Appropriated: to meet outstanding obligations, $15,000, and for maintenance during 1922, $20,000; pledged: for maintenance during 1923, $20,000; during 1924, $15,000; 1925, $10,000; 1926, $5,000, after which the Foundation assumes no further financial obligation for the Concilium. This means that the Concilium must arrive at a self-sustaining condition by January 1, 1927, or have found by then other philanthropic assistance.

It is proposed that a staff composed of a director, a competent secretary-bookkeeper, three trained technical assistants, three untrained assistants, and the needed stenographers and messengers, be arranged for at once. To maintain this staff and provide the necessary office expenses (postage, telegraph, telephone, fuel, lighting, etc.) the Concilium has not only the Rockefeller Foundation subvention but an annual subsidy of 5,000 francs (Swiss) a year from the Swiss Government and one of 1,000 francs (Swiss) from the Canton of Zurich. It has also whatever income can be derived from sale of its bibliographic cards and books. It has a building of its own, well suited and fairly well equipped for its work.

Thus the Concilium has, thanks to the generous action of the Rockefeller Foundation, a new lease of life and Dr. Field's noble and self-sacrificing work and his plans for increasing the Concilium's usefulness are not to go unregarded. Plans for extending the bibliographic work to other fields not now covered by it, and for a possible development of an abstracting system in addition to the present subject, title and author references, are under consideration. In this connection the managing board of the Concilium will need and will welcome all the advice that can be given it.

There should be, also, a greatly increased list of subscribers to the cards and books issued by the Concilium. The National Research Council will undertake a campaign to add to the list of American subscribers, and the Director (in Zurich) will institute a similar campaign in Europe. So I shall have occasion to ask the editor of *Science* for space in the near future for still another note about the Concilium.

VERNON KELLOGG
THE NATIONAL RESEARCH COUNCIL

HENRY TURNER EDDY

THE death of Henry Turner Eddy occurred at his home in Minneapolis on December 11, 1921, due to an acute attack of pneumonia, after only a few days' illness.

Dr. Eddy was born at Stoughton, Mass., on June 9, 1844. He was the son of Henry Eddy,

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BEING BORN ALIKE BUT DIFFERENT

BY VERNON KELLOGG

I

A LITTLE girl whom I know well and have known well for eleven years — she is not so little now, at eleven — is a constant stimulant of inquiry, passive, silent inquiry, for me. She herself is in a constant state of active inquiry of me. But always, as I watch her and hear her, I am asking myself: What will she be when she is grown up, when she is developed, fully developed? And always, close on that: What is making her, and is to make her, be what she will be? What has made her just what she is so far? And how much can anybody, including herself, help her or make her to be what it would please her parents to have her be when she is quite grown up?

She has blue eyes; so has her father. Perhaps she got these blue eyes from him. But she has a firm, straight mouth, the kind of mouth her mother has. Perhaps she got her mouth from her mother. She can read and write and do fractions, and each day now can speak a little more French. Both her mother and father can read and write and do fractions, and they know some French. But, if she got these things from her parents, she got them in another way than that in which she got her blue eyes and straight mouth from them. Having blue eyes and a straight mouth came just naturally with being born. Being able to read and write came by being taught. But the being able to be taught to read and write came with being born. Some little girls of eleven cannot learn to read and write and do fractions, nor will they ever be able to, teach them as much as you like, as long as they live. On the other hand, some little girls of eleven can do rather remarkable things in singing, or playing the piano. A few little girls and boys have done very remarkable things in music at eleven. But the little girl of eleven I know so intimately cannot play the piano especially well, nor would she have been able to, even if she had had many more music lessons than she has had. She is, in a word, not a musical genius. Being a musical genius comes with being born, although to do what a genius can do at the piano requires also much of teaching and practising.

Finally, this little girl of eleven is usually well-behaved. Sometimes she is n't so well-behaved, and after one of these times, and when there has been a general family discussion of the matter, she will decide to behave better, and will say so, and will really do so. She seems to be able to determine for her-

self, in some measure, what she will or will not do.

So, altogether, there is evidently a various and mixed lot of things that take part in making a little girl what she is and what she is going to be. Sometimes I think this little girl is growing more and more like her mother; and I am glad. Sometimes the disturbing fear assails me that she is taking after her father altogether too much. But what can I do? And what can any of us do to have our children grow up to be what we should like them to be? We can be good examples — *if* we can. Yes, but good exampleship has little to do with making firm mouths and what goes with firm mouths, or with making good looks, or good brains, or musical genius. A lot goes just naturally with being born, and this may be good, or less good, or even bad. Can this good be made better, and how much better, and this bad be made less bad, or even not bad at all, by doing something to children after birth? We all want very much to know about this. Can the biologist, who studies birth and development and heredity and variation and the influence of environment and all the rest of the processes and ways of Nature that help to determine the fate of individuals and species — can he tell us anything worth more than merely being interesting? Can he answer any of our questions with any such degree of assurance as to help guide us in our behavior in relation to the problem of human individuals and human society presented by the likenesses and unlikenesses of human beings? I suppose we are all willing to let him try.

II

A female codfish drops into the seawater in which it lives a few million eggs. From all of these eggs which do not get eaten or otherwise destroyed, and which do get fertilized by sperm dropped into the water by a male codfish, hatch tiny creatures, all of which, excepting those that get eaten or otherwise destroyed, — and this is the fate of most of them, — grow up to be fishes that are unmistakably codfishes.

A female robin lays in a nest four or five pretty blue eggs which have been fertilized in her body; and from these eggs, if storm or blue jay or oölogist does not prevent, hatch as many naked helpless birdlings, which are fed for a while by the parents, and grow up, if no ill luck befall, into unmistakable robins.

A cow produces in her body, every now and then, several eggs, from any one of which that gets fertilized in her body, a fœtus develops, which, after a number of months of gestation, is born as a calf, dependent at first for food on its mother's milk, and later able to forage for itself, and which grows up, barring misfortune, into an unmistakable cow or bull.

And, finally, and in much the same way as with cattle, our own children are conceived and develop and are born and grow up into unmistakable human beings. Codfishes, robins, cattle, and human beings all reproduce themselves in essentially the same way; and in this process the end-product, or new individual, is always of the same animal kind or species or breed as the parents. Codfishes produce codfishes, robins, robins; cattle, cattle, and Jersey cattle, Jersey cattle; human beings, human beings, and black human beings, black human beings, and yellow ones, yellow. Like begets like.

But — and this is as true and important as the first axiom — like never produces exactly like. That is, while in gross the offspring are like their parents, who are like their own parents, and so on indefinitely backward, in kind or species and in race or breed, and even are more like the members of their own

particular stock or family than like the offspring of other families within the same species, in detail they are always different from their own parents and grand- and great-grandparents, and they always differ from each other. No two living individuals are ever exactly alike, even if these individuals be twins, or even so-called identical twins. Biologists believe that no two organisms have ever been exactly alike, or will ever be exactly alike. No codfish is ever exactly like any other codfish, nor any robin, or cow, or human being exactly like any other individual of its own species or breed or family. This is the biological fact, or law, of variation, as the statement that like produces like expresses the biological fact, or law, of heredity.

Biologists quibble a good deal over names and definitions. Some use the word 'heredity,' not to name a natural law, — which is, indeed, not a 'law' in the usual sense of the word, but only a concise and generalized expression of a long experience or of many observations, — but to express by a single word the combination of many causes or factors which make like beget like. These biologists think of heredity as a process or an influence or a power. Some biologists include the law of variation within the law of heredity. And so on. No matter. Let us not trouble about a precise usage of terms, for there is none. Let us understand that we want to talk together about the facts and phenomena and methods and causes and, perhaps, above all, about the significance and, particularly, the significance in human life, of being born alike but different. We shall, I think, mean what most biologists mean when we use the word 'heredity' to indicate that we are talking about being born alike; and we shall mean what most biologists mean when we use the word 'variation' to indicate that we are talking about being born different.

Heredity and variation: being born alike but different; two things or two phases of one thing, than which I know no other thing in biology of more importance for human beings to understand, if they want to understand as much as they can of human life and of the unescapable natural conditions under which it must be lived.

Although it is about the conception, birth, and outcome through development, of human individuals that I wish especially to write, with the significance of all this to human social organization and to the fate of human individuals, communities, and races, I have bracketed animals and men together in my remarks so far. This is for two reasons: first, I want to make clear that in these matters of conception, heredity, and variation, men and animals are in the same boat, are subject to the same fundamental natural processes; and, second, I want to be able to speak freely, as a biologist speaking of any biological problem, about these matters, without offending the sensibilities of readers unused to biological discussion, — without, in a word, seeming to be indelicate. I can do this, perhaps, best by discussing birth, heredity, and variation in animals, and saying that this discussion is equally true and applicable for men, — in so far as it is, — and thus escape giving offense to the easily offended. Although I cannot help wondering why I feel that I ought to do this, when I remember that many books and plays of wide popular approval owe much of their interest and vogue to the fact that they devote themselves chiefly to an intensive and very frank consideration of a special phase of this whole matter, the phase of loving, love-making, and love-crowning; and the franker the account, the more successful the book or play.

But my most important reason for bracketing animals and man together

in this discussion is to emphasize the fact that conception, birth, development, heredity, and variation are all matters truly common to both animals — and, indeed, plants — and man, and that we can no more escape — with exceptions to be noted — the control and fateful determination in human life of these things than animals or plants can. And we are quite accustomed now, since biology and evolution have come to have a certain familiarity for us, thanks to the gradually widening form of general education, to accept the validity of the relation of these things to the determination of animal- and plant-life; or, as we might say, if we thought more of plants and animals as individuals and not as species, the relation of these things to the fate of individual plants and animals. Well, just so they have their close and unescapable relation to the fate of humans.

We shall want to examine a little more carefully this matter of heredity tending to make us — by 'us' I mean other animals as well as man — like our ancestors, and variation tending to make us unlike. I shall want to go beyond the casual observation that reveals to anyone that this is true, to refer to a few examples in some detail, and to attempt to analyze and contrast certain factors that contribute to making us alike and yet different. We recognize readily both the likenesses and unlikenesses in the case of human beings and some familiar domesticated animals, as cattle; but we are less likely to recognize the unlikenesses, and more than likely to overrate the likenesses, among codfish and robin individuals — unless we happen to be special students of codfishes and robins.

But before doing this, and in order to do this intelligently, we need to scrape rapid acquaintance with some of the details of the phenomena of conception, and embryonic and post-embryonic development, common to the production of all new individuals, and out of which appear the final likenesses and unlikenesses among them.

The biologist likes to work back to beginnings. So do the geologist and physicist and chemist. To the evolutionist, getting at the beginnings is the absolute prerequisite to getting at the evolutionary course and probable evolutionary fate of chemical elements — rocks, plants, animals, human beings, the earth and other planets, the sun and other stars, the universe. The evolutionist is the most aspiring of scientific men, for he studies the past and present primarily to become able to prophesy the future. And to prophesy is the ultimate aim of science. Let us then hitch our wagon to the stars: let us call ourselves evolutionists.

III

Biologists have a convenient single word to express the life history, from the beginning egg, through all the development and maturity and senescence and, finally, the death, of a single individual. The word is ontogeny. As a running mate for this word, they have another, to express the evolutionary history of a single species or race, its beginning by sudden mutation or gradual transformation from another species, its evolutionary course and final fate, and its genealogic relation to other species or races. This other word is phylogeny.

There is a sort of fundamental parallelism between the ontogeny, or the life history of an individual, and the phylogeny, or evolutionary history of the species to which the individual belongs. The parallelism has been expressed by the generalization that 'ontogeny recapitulates phylogeny,' which is the basis of the 'recapitulation theory' of von Baer, Haeckel, and

other generalizing biologists, of some years ago, who saw in this generalized fact an easy way of learning about the evolution and genetic relationship of any plant or animal species, by making an intensive study of the development of a single individual of the species. It was this generalization that gave such an impetus several years ago to the study of embryology, and upon which, some years later, certain pedagogue devotees of child study based their interesting, but rather undiscriminating, recognition of the monkey stages in child life.

The difficulty about the recapitulation theory is that it is n't true — in detail. In a large way, it is true. In the embryonic life of a child, that is in its earlier and, to most of us, hidden stages, from fertilized egg through fœtal development to time of birth, it does pass through stages which pretty clearly reveal our fundamental evolutionary relationship to the lower animals. It passes through stages, common, with characteristic variations, to the development of all mammals. You have seen the familiar pictures of the early embryos of various animals and man, showing them all so much alike that only a trained student of embryology can confidently distinguish the general group of animals to which a given embryo belongs. But, by the time the human babe is born, it has got on so far in its development that it is well by all fish and monkey stages and is unmistakably and fascinatingly human. It is more than that: it is a human being of a given race, Negro or Mongolian or Indian or Caucasian. And it already shows various specific physical, and, very soon, various mental characteristics, which not only indicate its particular stock, but which are to have a large part in determining its fate as a human individual. It is born, in a word, with all of the general characters of humanness, and with an hereditary endowment of particular physical and mental traits already apparent, and potentialities of other traits which are to appear in due course in its development to maturity, or, as the biologist puts it, in its post-embryonic development.

For any individual to recapitulate in its short ontogeny, — from a few hours to a few years, depending on the kind of animal, — in any detail and with anything like completeness, the phylogeny of its species, is simply impossible; and it, equally simply, does not achieve this impossibility. Whole phyletic stages are suppressed; others are compressed and modified. And, in addition, new non-phyletic adaptive stages, necessary to the successful life of the individual as embryo under conditions not at all identical with the external conditions surrounding any stages in the phyletic history of the species, are interpolated into this ontogeny, tending to confuse, and mislead, the student trying to unravel from a study of individual ontogeny the phyletic history of the species.

Take, for instance, a single example: the ontogeny of a butterfly. Born as a caterpillar (larva), representing in gross some wormlike ancestor in its phyletic history, but in detail very different from any worm that ever existed, it leads an active life for a few weeks or months, equipped by adaptive physical structures to crawl and eat leaves. Then it changes to a non-eating, immobile chrysalis (pupa), in which stage a breakdown of its caterpillar organs occurs, with the simultaneous development of very different organs; and, finally, after some days, weeks, or months, depending on the kind of butterfly it is, it issues as a flying, nectar-sucking, very unwormlike creature, for poets to sing about and entomologists to chase and kill and pin up in their cabinet cemeteries.

Do you think that in the evolutionary phylogeny or genealogy of butterflies, there was ever an ancestor like a present-day butterfly chrysalid? You do not think so; and neither does any biologist. The ontogenetic chrysalid-stage of a butterfly is an interpolated adaptive stage, to meet certain needs for radical changes to be made swiftly. The butterfly issues from its protecting egg so early in its life, — so prematurely, one may say, — that it is thrust out in the world to fend for itself in an ontogenetic stage roughly corresponding to a worm-stage in its phylogeny. But it has to adapt itself to a present environment, which may be very different from the past environment in which this worm ancestor lived. And so the young (larval) butterfly is very different from any worm that ever existed, and its necessary adaptation to a crawling, leaf-eating life carries it even away from the final butterfly-stage, which it must, after all, attain. It therefore devotes the worm-stage of its life to overeating, so that much food, in the form chiefly of fat, is stored in its body. Then it changes into a non-eating, motionless stage, in which it lives on its stored fat and in which it goes through the great bodily changes necessary to become a butterfly.

Now, if human beings were thus thrust out into the world, at a much more immature stage in their development than they are actually able to reach in the protecting and food-supplying mother-body, human post-embryonic life might be very different from what it is. The young of some mammals, as the kangaroo, are at birth more immature than a human babe, and they demand a somewhat different care from the care we give a babe. The just-born young of some others, as cattle, sheep, and the ruminants generally, are distinctly more mature. The calf and lamb can use their legs for proper gamboling very soon after birth. They demand much less care than a human babe.

But our discussion has gamboled, too, instead of sticking to the sedate and ordered way of our original intention. There is so imperatively much that comes crowding forward to be got into this short story of being born, that I cannot see my way clearly. However, we were, when we began gamboling, just at the point of taking up in a little detail those processes that go with being born, which especially have to do with determining likenesses and differences among us as individuals. So let us go back to these processes.

IV

Almost every animal individual begins as an egg. An egg is a single cell, made up of a little protoplasm, differentiated into a small central nuclear portion and a larger, distinguishably differing surrounding portion, together with a smaller or larger supply of food (albuminous yolk), usually surrounding the protoplasm, though sometimes scattered through it. In the eggs of some animals, especially birds and reptiles, this food-mass may be very much larger than the protoplasmic mass, and thus make the egg very large. Usually it is very small.

If we put aside those simplest animals, called Protozoa, whose body, through their whole lifetime, is never composed of more than one cell, and among which new individuals are often produced by a simple dividing in two of the parent individual, then there are very few animal kinds among which new individuals do not always begin as eggs. Among the higher animals, and with man, beginning as an egg is the absolute rule. And this egg has to be a fertilized egg: that is, the egg, which before fertilization is a sex cell produced by a mature female individual, has to

have its protoplasmic part found by and fused with a sex cell from a mature male individual of the same, or a very nearly related, species or kind of animal.

There are exceptions. These could be passed over as of little significance if they did not furnish us with a clue to the interesting fact that fertilization is a double function, and not, as perhaps commonly thought by most laymen, a single function. One part is essentially chemical or physico-chemical in its nature, and the other more truly vital or biological in its nature. Those exceptional cases in Nature in which new individuals develop from unfertilized eggs — the cases are exceptional rather as to kinds of animals which exhibit them than as to individuals, for among some kinds of insects, as aphids, the social bees and wasps, and others, more new individuals are produced from unfertilized eggs than from fertilized — have led to a lot of fascinating experimentation, associated in this country especially with the name of Jacques Loeb. The newspapers and magazines have made his 'fatherless frogs' familiar to many — and probably rather irritating to him. This experimentation has shown that, with many kinds of animals which regularly, or at least usually, produce new individuals only from fertilized eggs, the application of various chemical or physical stimuli to unfertilized eggs will compel them to begin developing. This development usually does not go far; but in some cases it can, and does, go clear through to the achievement of fully developed new individuals. These cases of artificial parthenogenesis, as also the cases of natural parthenogenesis, are restricted, so far as is yet known, to the lower animals, mostly, indeed, to invertebrate animals. The fatherless frogs are at the top of the scale. No mammals are included in the list.

Now, from the observations of these cases of inducing development by a chemical or physical stimulation of unfertilized eggs, those biologists belonging to the mechanist school, who see in so-called vital phenomena only more complex — and not always more complex — phenomena of physics and chemistry than the physicists and chemists usually have to deal with, claim, very plausibly, that fertilization is, at least partly, nothing more than physico-chemical stimulation.

And they can similarly explain the mysterious, or apparently conscious, seeking and finding of the immobile female egg by the smaller, free-swimming, male sperm, as no more than a phenomenon simply induced by the presence of some chemical substance in the egg irresistibly attractive to the sperm. For example, I remember an experiment that the famous plant physiologist, Pfeffer, of the University of Leipzig, used to make in the course of his lectures. He would put a tiny glass tube, open at both ends, filled with diluted malic acid, in a vessel of water in which were millions of the swimming sperm-cells of a fern. In a short time, as the malic acid began to diffuse into the water from the ends of the tube, the fern sperm would gather about the tube-ends and then go into the tube, until finally it was crowded with them.

'And so you see, *meine Herren*,' declared the professor triumphantly, 'all that the fern egg-cells need in order to get fertilized is to have a small quantity of malic acid in them, which, as a matter of fact, they have. There is no mystery of vitalism about it.'

But there is, of course, another and very important matter about fertilization. That is the matter of endowing the young with the double line of heredity represented by, and coming through, both mother and father, and passed on to the new individual by the fused sex-cells of which the fertilized egg is com-

posed. The fatherless frogs and the parthenogenetically produced aphids have only one line of heredity represented in them — the maternal line. But the new individuals that come from fertilized eggs have two lines of heredity physically inherent in their bodies. And we shall see that the great, and biologically very important, fact of variation depends in no little degree on the fusing of two different lines of heredity. This fusion of body-part (sex cells) and of heredities, perhaps for the sake of producing variation, perhaps for some other reason, is the other function of fertilization.

V

Now, what the fertilized egg, which is a single cell produced by the fusion of two cells, first does in the way of development into a new complete individual, composed of thousands or millions or billions of cells, is to divide in two. And then each of these two daughter cells, — which, of course, do not separate and move apart, as they do in the case of the formation of new individuals by the fission of a one-celled (Protozoan) animal, — after growing a little larger (sometimes as large as the parent egg-cell), divides into two; and then these four cells similarly divide, and so on, until the developing egg is a small, usually spherical, mass of cells, usually similar in appearance though, with some animals, varying in size.

An interesting series of performances on the part, first, of the one-celled egg, and then of the daughter cells, goes on in connection with all of this dividing. These performances are too many and too elaborate to be described here, but they are very significant and important. The result of them is to achieve a very precise division of the cell material, which affects nucleus as well as general cell protoplasm, and special elements in the nucleus, called chromosomes, as well as the undifferentiated rest of the nucleus. These chromosomes are broken-up bits of a special part, usually in threadlike shape, of the nuclear material, called chromatin (because it is especially easily and strongly colored by the stains used by cell students in their efforts to make visible the differentiation that exists in the cell structure).

Now, these chromosomes are believed by most students of the mechanism of heredity to be the actual carriers of the hereditary potentialities of the new individual which is to develop from the egg. That is, they are supposed to be composed of actual physical unit representatives in the egg of the many traits of structure, physiology, mentality, and even of soul, — if we go to the logical extreme — which the developed individual will possess by virtue of inheritance. Of course, as they exist in the egg, they are not such traits, nor in the slightest degree suggestive of them — nobody inherits any traits as traits; but because of these physical particles in, or composing, the chromosomes, such-and-such specific traits will develop and be possessed by the new individual.

These traits, I say, have to develop. The human egg is not, nor does it contain, as some of the earlier naturalists, before the days of better microscopes, believed, an homunculus, a tiny human being with all its organs in miniature, needing simply to grow, or enlarge, to be the new baby and then the new man. But neither is it, as many naturalists came to believe, when the improvements in the microscope enabled them to prove the falsity of the earlier 'preformation theory,' a simple bit of undifferentiated protoplasm, capable, by virtue of response to external stimulus and environment, of developing into a new, highly organized creature. We know now that, while there is no pre-

formed tiny human being in the human egg, the egg is, nevertheless, more or less, perhaps very highly, differentiated, with parts that have direct correspondence to future parts of the new individual. But we know also that the conditions under which the development of the egg goes on can greatly modify the fate of any part of the egg mosaic; can modify profoundly the developmental plan, as it were; and that, without proper stimulus and environment this plan, with all the physical representation of it in the egg, can come to nothing. Inherited traits appear because they are represented some way in the egg. And other traits can appear because some special environmental influence forces them on to the developing individual. These latter new traits, or modifications of already represented traits, are said to be 'acquired.' They differ importantly from the so-called inherited traits, in that they will not appear in the children of the new individual acquiring them, unless the similar special environmental conditions that surrounded the parent and determined the development of these special acquirements are repeated during the development of the children. On the contrary, the inherited traits of the parent will tend to appear again in the children — although in never the same condition — under the usual normal environment of the species.

VI

These references to preformation in the egg, or predetermination of the course of development, and to environmental necessities and possibilities in development, introduce us to a fascinating phase of biological study and special investigation, called by the Germans, who were the pioneers in it, *Entwicklungs-Mechanik*, the mechanics of development. Its importance comes especially from two principal things about it: first, it introduces into biological study, which for a long time was almost exclusively simply an observational study, the reasoned application of careful experimental work, with constant references to facts of physics and chemistry and an adoption of the methods which have led to the high development of these sciences as exact sciences; and, second, it involves the getting at, and close observation of, the earlier and presumably simpler stages of animal development, and of the factors that control this development. It is a kind of study more exact and, to its disciples, perhaps no less interesting than child study. At any rate, these disciples would maintain that their intensive study of the mechanics of development should be of some use to scientific students of child development.

We can, of course, do hardly more in this paper than just venture to suggest the significance of certain outstanding facts revealed by the study of *Entwicklungs-Mechanik*. Indeed, you may have become already impatient of my persistence in so long trying to hold your attention to the egg and embryo stages of existence. But knowledge of the varying things that help control the development and outcome of the egg and embryo is knowledge that throws much light on the phenomena of later development, and that can help us to understand what may be possible and what is impossible in connection with our attempt to make this later development run according to our desires.

One of the outstanding problems in this later development is that of recognizing in it, and appraising, the relative influence and importance of nature and nurture, that is, the influence of heredity and the influence of environment and education. Which has the greater importance in determining the course and outcome of this development? What

part of this outcome results from the one, what from the other? Well, the same problem faces the student of developing egg and embryo. But in the case of the study of the animal egg and embryo, one has more opportunity to apply the experimental method than in the study of the post-embryonic development; although it must be admitted that a good deal of experimenting, of a kind unfortunately not too scientific in manner, is done in the case of the developing child and youth. A good deal of our education seems still to be more of the nature of experiment than of well-determined method.

But let us now take our last look, with the aid of some light from *Entwicklungs-Mechanik*, at the developing egg and embryo.

Recall, please, the more obvious phenomena in the course of the early stages of the development of the fertilized egg; and in doing this, keep in mind the two contrasting, although closely correlated, sets of influences determining these phenomena. The early stages are the division of the single-celled egg into two cells, and then into four and eight and sixteen and so on, until there are many adherent cells. And then the gradual specializing of these cells, at first similar, into different kinds of cells, elementary nerve-cells and muscle cells and epithelial cells and blood cells and sex cells and so on, forming different tissues, and the simultaneous gradual arranging and grouping of these specializing cells and tissues into different organs and body-regions. The two sets of contrasting, although mutually interacting and correlated, influences may be called influences of predetermination, or intrinsic or hereditary influences, and influences of epigenesis, or extrinsic or environmental influences.

And now, keeping this in mind, let us play with our developing egg and embryo. For this we need a good microscope, because an animal egg, or at any rate, the part of it that is not yolk (food) but is the developing germ, is very small. And we need several very finely pointed needles, and a wonderful pair of scissors with minutest of blades, and a few other simple instruments, and some chemicals. Also, we need a lot of patience, and perhaps somebody to bring our meals to us while we stick to the microscope; for we may have to sit for many hours with hardly an interruption to our close watching. I knew a German *Privatdozent* in the University of Leipzig, famous for his studies of cell genealogy, who kept up his continual watching of a developing egg of Ascaris, a worm parasite of horses, for all of a day and a night and the next day. But he discovered many things of great interest and significance, whose telling made him the author of a monograph in biological science which is now a classic. And that is high reward for a biologist.

If everything that determines the course of development of an egg — granted that the necessary general external conditions are provided — is inherent in the egg itself, then we might speak of this developmental course as predetermined for any given egg, and might even speak of the egg, or embryo, which develops from it, as preformed, although, as already said, this preformation does not mean the existence in the fertilized egg of a complex embryo in miniature. It simply means that any given part of the egg, or one of the early daughter cells into which it divides, is predestined to become, by further development, a certain given part or organ or kind of tissue of the embryo and hence of the final fully developed new individual. On the other hand, if the egg gets its stimulus for development from outside, and is chiefly controlled during its development by environ-

mental conditions, then its manner of development will vary in accordance with any variation in the external stimuli and conditions brought to bear on it. Here the experimenter comes in.

A classic early experiment on the frog's egg seemed to prove the theory of preformation. With a finely pointed, heated needle one of the two daughter cells into which the egg first divided was killed by the experimenter, although it was left attached to the other live cell. The other cell went on and produced a half-frog embryo! *Ergo*, each half of the egg, or certainly each cell arising from the first division of the egg into two cells of equal size and similar appearance, had for fixed fate the development into the right or left half of a frog.

But another experimenter, instead of killing one of the first daughter cells of the frog's egg, succeeded in separating them entirely, — thus removing any contact stimulus from a dead but still adhering daughter cell, — and found that each daughter cell, or egg-half, developed into a whole frog embryo of half, or at least unusually small, size! And still other experimenters succeeding in separating, in the case of eggs of certain other animals of lower type than the frog, not only the first two daughter cells, but the four and the eight and even the sixteen, produced by successive divisions of the developing egg, and got from each separated cell a minute but complete embryo. *À bas* preformation; *hoch* the theory of epigenesis!

But the preformationists came back. By the careful watching, like that of the Leipzig *Privatdozent*, of eggs of various animals developing under normal circumstances, it was shown that certain specific tissues or organs of the later developed embryo have their origin from specific single cells in the four- or eight- or sixteen-cell stage of the developing egg. In other words, each of these early daughter cells, which are, in effect, specific parts of the original, one-celled fertilized egg, produces a specific part of the later embryo and developed individual. Which is what would be expected from preformation.

Also, if the group of daughter cells resulting from the repeated egg cell-divisions are prevented from assuming their normal relative position with regard to each other, by being compressed between thin sheets of glass, and so made to lie all in one plane instead of in a spherical mass; or if they are otherwise constrained to depart from their usual habit of arrangement, then, when the constraint is removed, they tend strongly to assume the space-relation to each other characteristic of normal development. On the other hand, if this physical constraint lasts too long, or if the usual medium in which the egg develops, — sea water, say, — is modified by changing its physical character (density), or its chemical composition, then this change in environment produces a structural change in the character of the embryo, or larva, into which the egg develops.

In a word, the experiments of the students of *Entwicklungs-Mechanik* show that, while there are strong intrinsic influences in the egg, which guide its development under usual or normal environmental conditions along a definite path, yet any sufficient modification of the extrinsic conditions (environment) affecting the developing egg or embryo can change this path and produce a modified individual.

Well, we shall see (in our next paper) that exactly the same struggle or correlation exists between heredity (intrinsic influences) and environment or education (extrinsic influences) all through the post-embryonic development of any animal and the childhood and adolescence of a human being. And the outcome of this development,

all the physical, mental, and spiritual characters of the new individual, is the resultant of these sometimes opposing, sometimes reinforcing, intrinsic and extrinsic factors or influences.

My little girl is what she is so far, and will be what she is at any time in her life, because of the interacting influences on her of her biological inheritance (intrinsic factors) and her social inheritance (environment and education). I cannot do anything now to change her biological inheritance, but I can do much to control her social inheritance. We are back to our question of the beginning of this paper. 'A lot goes just naturally with being born, and this may be good, or less good, or even bad. Can this good be made better, and how much better, and this bad be made less bad, or even not bad at all, by doing something to children after birth?'

In our next paper, I propose to seek for some light on this by an examination of the facts of the 'new heredity.' By the new heredity I mean what has been learned in the last fifty years. It is more than had been learned in all time before.

(*Dr. Kellogg's next paper will be 'The New Heredity'*)

AMERICA AND THE OPIUM TRADE

BY ELLEN N. LA MOTTE

I

In a recent issue, one of the great London newspapers contained a long article on the question of the Irish settlement, expressing satisfaction on the removal of a cause of friction between England and the United States. 'But the greatest cause of all for relief is that now America can have ordinary and natural relations with Great Britain. Whatever it is natural for the two nations to do in relation to each other can now be done. No longer will there be the embarrassment of something that cannot be talked about openly and freely. There will be no uneasy self-consciousness in their relations. If any among us ever again try, as some have tried in the past, to prevent the consummation of treaties or agreements of generous understanding, by taking an anti-British point of view, they will be asked what justifies their position, and they can no longer justify it by allusion to Ireland. That allusion, on more than one occasion in the past, has been enough to prevent the relations of normal friendliness between the two nations.'

There is another allusion, however, to one of Great Britain's policies, which cannot be talked about freely and openly, without uneasy embarrassment, and which at any moment may be used to arouse anti-British feeling, to create political capital or political trouble. That allusion is to Great Britain's opium trade, established by law in many of

Can We Sort Them at the Gate?

By VERNON KELLOGG

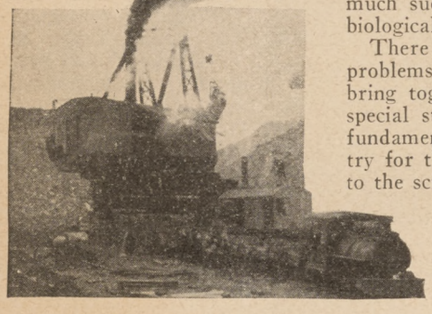
SCIENCE is lifting its unashamed head in the company of so many groups of men interested in so many different problems of our American life that it is not surprising to find it showing its face among those interested in the present pressing problem of immigration. One encouraging thing about the appearance of the devotee of natural science here and there among groups of historians, economists, sociologists, statesmen and other representatives of the social sciences, is that he brings with him no preconceived prejudices, except a strong prejudice in favor of facts and rigorous methods of ascertaining these facts. He brings with him no self-interest. He has no axe to grind, except the axe of truth. Hence he should be welcomed.

There are definite scientific phases of the immigration problem. By this I mean phases which, for their proper consideration, call for the special aid of the student of the natural sciences as contrasted with the student of political science, economics or sociology.

There is, of course, in connection with the study of human life, properly no sharp line of distinction between those special fields of natural science which relate to human biology, such as psychology, anthropology and general biology (heredity, environmental effect, etc.) and the fields of the social sciences.

Practically, however, a somewhat hazy line of distinction does exist. But the whole tendency of modern scholarship is to break down the artificial boundaries or barriers which have been set up among various special lines of human thought and interest. These barriers have impeded progress. They have, especially in connection with the study of human life, developed unfortunate antagonisms. Political science and political economy have considered themselves quite competent to set up, unassisted by anthropologists, psychologists and biologists, rules for the conduct of human society.

The sociologists have not been so confident. In fact, they have tried to get themselves established on a foundation of biology, although not with too much success, for so few of them have any fundamental biological training or understanding.



There is needed, for the proper study of many human problems, a special type of biologist-sociologist who can bring together and weigh fairly the facts ascertained by special studies of human life carried on with the known fundamental biological laws constantly in mind. Let us try for the moment to act in this capacity in our approach to the scientific phases of the immigration problem.

The phases of this problem which concern the scientific man are especially two: the matter of racial characteristics and the matter of racial hybridization.

Have the various races or peoples of Europe and the East, which contribute quotas to our total immigration, distinctly varying characteristics, and if so, can these characteristics be classified roughly into good, indifferent and bad characteristics? Of these characteristics, what are the ones due to heredity or inherent race character, and what are those due to environment and education?

There is no doubt that the various European peoples do possess differentiating characteristics, but it is very important to know whether these differing characteristics are the acquired and more superficial ones due to differences in environment—climatic, political, economic, religious, educational, etc.—or the inherent and more fundamental ones due to racial inheritance.

Our problem of selection among candidates for immigration and our problem of Americanization of the accepted immigrants greatly depend for solution on scientific knowledge of these matters. If these racial and national differences are all due to the effects of varying environment, they can be more or less rapidly modified by new environmental and educational conditions. If, however, these differences are mostly due to actual biological inheritance, they cannot be so easily changed.

The convinced environmentalists, represented by the professional educators and a rather small group of anthropologists and biologists, look on these racial differences as being mostly of this acquired kind, and hence see no serious difficulties or disadvantages in these importations of varying peoples or in the racial hybridization that is now going on in America and will continue to go on as long as immigration continues.

They see no serious biological difficulties in the Americanization of these newcomers and their children and of the offspring of their crossings with each other and the American stock. The whole solution is good environment and education.

But there is a larger group of anthropologists and biologists who recognize other dif-

ferences among various races and peoples than those immediately due to the effect of varying environment and education. They see inherent inherited differences among them. And they know that these differences cannot be quickly extinguished or even radically modified by new environment and education, however good and abundantly provided. And they see not only a persistence of these traits—good, indifferent or bad—in the people possessing them, but they also see them handed on to their children and children's children by heredity, and mixed, also according to the laws of heredity, with the traits of our native stock by inevitable hybridization.

Now human hybridization is not *per se* necessarily an evil, despite much popular belief that way. The plant and animal breeders constantly use hybridization to bring into existence better types of domesticated plants and animals. They also use inbreeding for the purpose of holding these better types true to their good points. Yet there is much popular belief that too close human inbreeding is bad for the race. But, no more than hybridizing or mongrelizing, is inbreeding *per se* necessarily bad.

The danger of inbreeding is that of bringing together individuals or types which have bad traits common to both, and hence likely to be accented in their offspring. The bad result in hybridizing comes when a race (plant, animal or human) with several bad traits is crossed with a race of several good points. The result is usually a mozaic of good and bad traits, perhaps, on the whole, better than the poorer parent, but not so good as the better parent. Sometimes, however, such a crossing produces a result inferior even to the poorer parent; but sometimes, also, one even superior to the better parent.

In the case of human racial hybridization there is a general popular presumption, based on miscellaneous observation, against Eurasian crossings, and similarly against Negro-Caucasian crossings. But because of the social prejudice against such crossings it may be that most of them occur only between particularly poor individual representatives of the races, the bad outcome, then, resulting rather from the individual inferiority of the parents than from racial mixture.

I have observed, too casually to serve as scientific basis for conclusion, some results of racial crossings in that natural laboratory of human hybridization experiments, the Hawaiian Islands. I have been struck by the apparently excellent outcome of crossings between the Chinese and other races. I saw in a single girls' school in Honolulu the results of some twenty or more different racial combinations. Some seemed bad; some seemed good. This only means that to know really—that is, with any scientific precision—what racial crossing means, we must do an immense amount of intensive and continued analytical observing.

We talk rather freely about racial dominance or prepotency in connection with racial crossings. But, so far, all we know about dominancy or prepotency in heredity is that certain particular traits—not particular individuals, or a particular sex, or particular races—are dominant in crossings. And even this dominance is only that of somatic, or bodily, character and not of germ plasm character. The good or bad trait, extinguished as bodily manifestation for a generation or so as a result of a crossing, may persist in the germ plasm and reappear later.

As regards the actual difference among races in inherent, heritable mental capacity (not mental culture, which is not inherited biologically although it may be passed on by social inheritance) the scientific men know something, although not very much. Thanks to the ingeniously devised intelligence tests used in the army psychological examinations and the fact that there were large foreign-born contingents in the army draft, it was possible to determine the inherent mental differences in the contigents representing various European peoples.

These differences indicate that certain northern nationalities, roughly grouped as members of the Nordic race, send to us immigrants that average higher in mentality than those which come from certain southern and southeastern European peoples, roughly grouped racially as Alpines and Mediterraneans.

The fact, of course, does not warrant any too swift generalizations about the racial mental capacity of different European peoples. There are undoubtedly among the best brains of southern Europe as good brains as exist in northern Europe, and there may be as wide a range of variation in mental capacity in the southern peoples as in the northern. But it seems almost certain that the southern nations contain proportionally larger numbers of individuals which are below the average mental standard than are to be found in the northern nations.

This has an important significance in connection with our immigration problem, for there has been a gradual shifting of the proportion of immigrants coming from different European countries to America. From 1887 to 1897 the immigrants included considerable numbers from England, Scotland, Ireland, Holland, Denmark, Norway, Sweden and Germany, but these numbers decreased materially after 1897 and in recent years have been comparatively small. On the other hand, the immigrants in recent years have included large contingents from Russia, Italy and Greece.

Now as a result of the intelligence tests of the army draft, 19 per cent of the recruits born in England were ranked in the A and B (highest) intelligence groups; of those born in Scotland, 13.1 per cent were similarly ranked; in Holland 12.4 per cent; Germany, 10 per cent; Denmark, 7 per cent; Sweden, 5.9 per cent;

Samuel G. Saklemian meeting his mother and brother at the dock, New York City. A prize of one year's subscription to THE NATION'S BUSINESS will be given to the reader who fails to guess in one guess the brother who came to this country ten years ago.

Norway, 5.3 per cent; while of those born in Russia only 3.3 per cent were so ranked, in Greece 2.2 per cent and in Italy 1.5 per cent. On the other hand 60.5 per cent of the Italian-born recruits were in the D and E (lowest) group, 55.7 per cent of the Russians, 44.6 per cent of the Greeks, 23.2 per cent of the Swedes, 17 per cent of the Danes, 16.2 per cent of the Germans, 13.5 per cent of the Scotch, 12 per cent of the Dutch and 8.8 per cent of the English.

These percentages do not necessarily mean that the relative position of these various European nationalities as regards mental capacity is indicated with any approach to accuracy by them, because these percentages are based exclusively on samples—and not very large ones—of these nationalities which have come to America. No one of these samples may fairly represent the whole nation from which it came. In fact, the emigration from a given country is almost always specially determined by particular economic, political or religious conditions, and these conditions may result in sending out of the country a group of individuals which is far from being a fair sample of the whole population. But, nevertheless, these percentages are worth paying serious attention to. They do reveal the kind of people we have actually received from these various European countries.

Quite as significant as the facts we have just referred to is the fact that there is a marked difference for the worse in the intelligence scores of the recent immigrants from *all* the European countries as compared with the scores for earlier immigrants. Now if the better averages of the earlier comers cannot be attributed to their better opportunities in America in the way of education—and the intelligence testing psychologists are convinced by many careful tests of the tests themselves that the responses to the tests do reveal only innate intelligence and not acquired information or education—then it is evident that we have been receiving in recent years distinctly poorer samples of the population of the foreign countries from which our immigrants come than we received in former years.

Well, these are the kinds of facts about immigration that the scientific man can find out and that make it necessary that any consideration of the immigration problem, to be sound and complete, must include an attention to the scientific side of the problem. The scientist must be asked to tell what he already knows and urged to find out more.

We need to know something as nearly precise and certain as possible about the kind and character of the traits, both physical and mental, of the peoples or races which are represented among our immigrants, and about the specific inheritance behavior of these traits—when they are of the heritable kind—in racial hybridizations. We really know now very little about either of these things. A lot of scientific work needs to be done.

To do some of it the National Research Council has set up a committee of anthropological and psychological experts, including special experts in vital statistics, heredity and environmental effect. This committee has carefully formulated a program of investigation and made a beginning of work on it. It takes up its task with no economic or sociologic or political prejudices. It is not trying to prove any particular thesis. It is trying to find out, by careful scientific methods, a body of facts which may be useful to know and consider in connection with any proposed governmental action.

Starting Right With Your Belongings

By WILLIAM FEATHER

I THINK most of us get keener enjoyment from a well-preserved, well-kept old article than we do from a new article.

A used article acquires an individuality from its owner that reflects his character as definitely as his face or spoken thoughts.

When a man appears in stiff, unwrinkled shoes, freshly tailored suit, and a hat that is as shapely as an aluminum boiling pot we suspect he may be a new congressman or a floor walker in a ten-cent store. One guess is as good as another.

Not until a man has worn his clothes for a time do they really fit him. While they are in the day-old stage it's the clothes you see and not the man. The man is a dummy for the display of the clothes.

This is not an argument against keeping shoes shined, clothes pressed and hats blocked, because after a man has begun to wear himself into his clothes, the individuality is there and neither steam nor blacking can take it out.

I know of nothing finer than an old home, built well in the first place and maintained in dignified self-respect by its owners for a half century or more. I passed such a home the other day, as I was walking away from the downtown district. The owners of five dozen other houses nearby had moved out, leaving their residences in the hands of rooming house proprietors. Lawns were neglected and fences were in disrepair, rubbish was heaped up in the backyards, windows were cracked, shades were torn, paint was blistered.

This old house stood sturdy on its foundation. The iron fence was as plumb as a steel column in a skyscraper. The lawn was cropped close, weeded, and neatly trimmed to the edge of the immaculate stone walk. Every inch of mortar in the stone work of the house was intact, the wood gables and window frames were freshly painted. The windows glistened. The shades were drawn to an event height. I have never met the people who live in that house, but I already know a lot about them.

The Waldorf-Astoria Hotel in New York this year celebrated its thirtieth anniversary. How many thirty-year-old hotels can face the world with as few apologies as the Waldorf? There is beauty in its age because it is clean, finely appointed, well-kept. It has an established character which is lacking in its newly-born neighbors.

Yesterday a friend told me of a barn he had seen on an automobile trip. Numerals on the roof showed the date of its construction: 1874. This barn stood out in his memory above everything else just because it stood up squarely, a monument to the good workmanship and the good citizenship of its builder and owner. Paint and repairs had maintained it in first-class condition for almost fifty years.

To me no experience is so depressing as to visit an office building which has been allowed to sink into a smelly, unclean, unworthy old age. This is unnecessary, for owners by spending a reasonable sum for upkeep can maintain their buildings in condition successfully to meet the competition of modern structures. In fact, the high ceilings, expansive halls, and solid walls of the old buildings make a strong appeal to many tenants.

This, then, is an appeal for the purchase of goods of sound quality to begin with, and the maintenance of this quality by a proper allowance for upkeep.

The tendency today seems to be to multiply the purchases of cheap things. Instead of two good hats, a man buys four cheap hats. When a hat needs cleaning or blocking, the owner throws it away. Likewise, the modern fad among automobile buyers is to trade in a car for a new one about the time the stiffness is out of it.

Under this policy handsome, well-built automobiles quickly pass to third-hand owners who have no pride in possession and the streets become clogged with broken-down thoroughbreds.

Maybe there is a dollars-and-cents advantage in this rapid change of ownership, but I think there will come a time when people will take pride in owning and driving well-groomed automobiles which have given ten or fifteen years of satisfactory service.

A final observation is that too many today over-extend themselves on the initial purchase and have nothing left for upkeep. Not only is this bad economy, but it indicates shallow character, being as it is, the reflection of a desire to advertise a false prosperity.

Texas Leaguers

THE idea is one part—getting the boss to OK it is three parts.

Say it with words—if you can.

As soon as some fellows get a private office where they can loaf without being seen they begin to rave about the workingman limiting production.

Oh what is so rare as a full day's work in June!

Our idea of a hard-boiled customer is an eligible bachelor who has successfully resisted the sales efforts of a hundred attractive women.

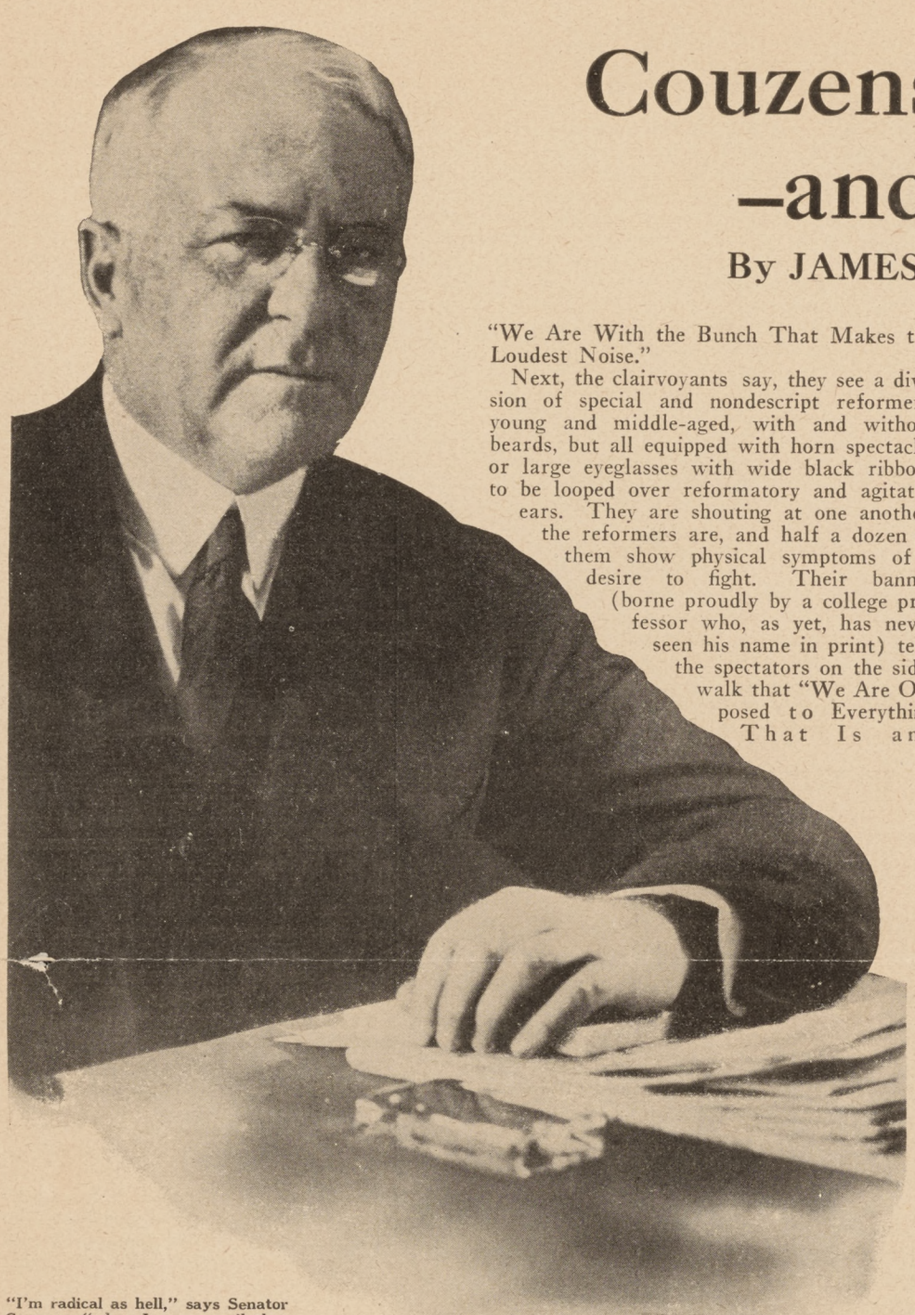
If the shoe pinches, buy a larger size.

Most of us vote against people, not for people.

At bottom, every man feels that he belongs on a farm—that he is just enjoying a leave of absence.

Couzens, Radical –and Rich

By JAMES B. MORROW



"I'm radical as hell," says Senator Couzens, "when I see an evil that ought to be ended."

© *National Photo*

CLAIRVOYANTS in Washington, often right, but occasionally wrong, say, with more than usual positiveness, that they see a procession, more real than allegorical.

It is marching through Pennsylvania Avenue toward the Halls of Congress. At its head, a jazz band of a hundred musicians, including two bass drummers, is playing with loud booms and ringing cymbals, the Star-Spangled Banner.

Following the band, the clairvoyants assert, are a small number of United States Senators, three abreast, led by those self-effacing and taciturn prophets of the meek and lowly, Robert M. La Follette, Smith Wildman Brookhart and Arthur Capper.

Representatives in Congress, some taking long steps, others taking short steps, several wearing frock coats, most of them, however, wearing sack coats or no coats at all, except across their forearms, march behind the Senators. They carry a banner, the Representatives do, on which is this solemn assurance: "We Are With the Bunch That Makes the Loudest Noise."

Next, the clairvoyants say, they see a division of special and nondescript reformers, young and middle-aged, with and without beards, but all equipped with horn spectacles or large eyeglasses with wide black ribbons to be looped over reformatory and agitated ears. They are shouting at one another, the reformers are, and half a dozen of them show physical symptoms of a desire to fight. Their banner (borne proudly by a college professor who, as yet, has never seen his name in print) tells the spectators on the sidewalk that "We Are Opposed to Everything That Is and Unitedly Favor Any Old Thing That Isn't."

The clairvoyants then see, so they prognosticate, two fat and pompous men carrying a huge white muslin standard, on which, in the blackest of paint, are the words: "Our Big Chief." Fifty feet behind the standard is a flivver, its top down and its sides and wheels ornamented with red, white and blue tissue paper, fashioned into stars, rosettes and garlands.

In the flivver, which is shiny and new, and at the wheel, you understand, the clairvoyants declare that they recognize James Couzens of Detroit. He rides alone, erect and smiling. A streamer on a slender pole, attached to the hood, informs the world, or so much of it as may be curiously watching, that, "I Have an Open Mind, But—"

The clairvoyants, going further, insist that ever and anon Couzens looks, first to the sidewalk on his right and then to the one on his left, and amiably and knowingly winks.

Warren S. Stone, chief of the Locomotive Engineers, William Z. Foster, the Napoleon of the steel strike that petered out, Eugene Debs, late of Atlanta, and Miss Schneiderman, "The Rose of Anarchy," keeping irregular time with their feet, their admiring eyes on "Our Big Chief," tramp down the Avenue behind the flivver and are followed, the clairvoyants declare, by a gesticulating and vocal company of minor labor leaders, socialists, communists, intellectuals, hobos and soap-box orators.

This miscellaneous throng also have banners. One reads:

> "Our Platform—Uncle Sam to Be Our Employer; Politicians to Fix Our Wages; the Civil Service to Keep Us in Our Jobs."

Another banner reads:

> "Government Ownership of the Railroads—the Wedge That Will Split and Splinter the Present Capitalistic Order of Industry."

Still another reads:

> "After the Railroads—Factories, Mines, Farms and All Other Sources of Production and Agencies of Distribution."

Interpreting their vision, the clairvoyants say: "It means that Senator Couzens is to be the titular leader in the next Congress of those in both the Senate and House of Representatives who are planning to take the railroads from their owners and hand them over to the National Government. The procession which we see means, and it is as plain as the nose on one's face, just that and all of that; and it shows furthermore, in detail, the elements which will coalesce until the cataclysm they hope to bring on the country is under way, whereupon every man will look out for himself.

"The reds and their variants and diminutives from light pinks to orange yellows," so runs the revelation of the clairvoyants, "honor wealth as much as anybody. If John D. Rockefeller, senior or junior, confessing the faith, were to set up as a revolutionist, even Lenine and Trotsky would take off their hats and sandals and scrape their noddles on the earth.

"Senator Couzens, it is figured" (the clairvoyants, remember, are still elucidating), "will give the magic of his millions and the prestige of his name to the socialistic project that is now being cooked up by such men as La Follette, Capper and Brookhart. 'Observe,' they will noisily say, 'that some patriotic and unselfish men of Big Business are heartily with us in our warfare against oppression and rascality.'"

"But Couzens might fool them and come out himself for the Presidency in 1924," the clairvoyants could be reminded. In which event the clairvoyants would immediately answer: "There is no danger of that; Couzens was born in Canada. La Follette, Brookhart and Capper know that they are safe in leaving Couzens in Washington, slyly to propagate socialism in bulletins and statistical

Atlantic Monthly April 1924

THE MODERN VIEW OF EVOLUTION

BY VERNON KELLOGG

I

WHEN there is talk of evolution among laymen it is because of an interest, first, in the evolution of man — our view of Nature is strongly anthropocentric; second, in the evolution of animals — we all recognize something of their kinship with us; and, third, in the evolution of plants — they are farthest away from us. By layman I mean anyone not a working biologist.

The working biologists use evolution all the time as a guide in their work, a determinant of their point of view and method of study, a proved and accepted fundamental fact and principle in the science of living things. Hence the biologist in his relation to evolution is as likely to be interested in the evolution of plants, or in a single group of plants, as in the evolution of animals, or even in the evolution of man — though even biologists are human, and it seems an attribute of humanness to have a prime interest in human beings. But now and then one comes across a naturalist who does seem to be more interested in extra-human Nature than in human nature. Just after the great California earthquake of 1906, which gave scientific men an unusual opportunity to study earthquake ways, the sister of a Western scholar confided to me, somewhat bitterly, of her brother: 'He is no longer a man; he is just a geologist.'

But the layman is always a man, and he sees most importantly in evolution something significant in the problem of the whence, how, and whither of man, and something that must be attended to in developing his world philosophy. Also, and of the same kind and degree of importance, something that has a specific delicate relation to religion, or, at any rate, to theology.

To the mind of the public, evolution has recently assumed again a position of seizing interest. The last time it had such an interest was in the immediate years after the publication of Darwin's *Origin of Species*. The psychological results of the tremendous cataclysm produced by the war have made men take stock of the status of religion among them. Is religion stronger or weaker because of the war? Or did the realized possibility of such a war, such an unchristian behavior on the part of supposedly Christian peoples, reveal an antecedent and continuing feebleness of religion that must be thoughtfully considered and immediately attended to? Whatever the reason, there has been, since the war, a quickening of attention among us in Europe and America to the status of our religion. And in course of this attention evolution has come again to the position of whipping boy for those who take their religion too emotionally and thoughtlessly, hence violently. If religion is weakened it must be the fault of something and somebody. Putting aside swiftly the uncomfortable thought of the possibility of anything being wrong with religion

itself and with its expounders, the fundamentalists see in those black beetles, evolution and Darwin, the disturbing and criminal something and somebody who are guilty of this weakening. Have at them! And Mr. Bryan does.

II

So here is evolution, especially the evolution of man, again on the defensive. Are we to go through, all over again, the recital of the classic evidences of the actuality and manner of evolution as read from the four great documents of comparative anatomy, embryology, palæontology, and geographical distribution? And then add to these the confirmatory new evidences that the years since Darwin have brought forth? Must we recall again the fundamental identities, with their obviously adaptive modifications, of the organs and organ-systems of man with those of the other vertebrate and especially mammalian animals; the convincing recapitulation in man's embryology of successive conditions of heart and blood-cells and lungs and brain and other organs, which conditions are more or less like the adult conditions of these parts in the successively higher vertebrate classes, the fishes, amphibians, reptiles and birds, and, finally, mammals; the occurrence of fossils of prehistoric man from the days of early glacial time, a half-million years ago, up to the near-present, showing the gradual changes in skeletal structure, with their unmistakable implications, the straightening legs and reducing jaw and orbital and occipital crests, and the expanding brain cavity, in a word, the changes from beastliness to humanness; and, finally, the distribution of the living races of man in such a way as to tell the same story as the distribution of the animals and plants? Must all this overwhelming testimony that man is an evolutionary product be rehearsed again because Mr. Bryan says that it does n't exist; or that, if it exists, it need not be taken into account by the truly informed, who have in the book of Genesis a complete manual of world and human origin?

If so, biologists are willing to tell it all over again. But it does seem absurd to have to do it. Especially when there are some other matters concerning evolution that have not been so often retold, and rather need telling and discussion. Sixty years of active study since Darwin, of evolutionary phenomena and of technical discussion among specialists, do not leave evolution just where it was when Darwin and his coadjutors had to drop it. For example, Darwin saw in natural selection a satisfying explanation of the origin of species. We do not see this now. We see in natural selection an important factor in the control of evolutionary lines of plant- and animal-development, and a restraining sieve for the too unfit species, but not a sufficient unaided cause of species-transmutation and -adaptation. There is no mere 'survival of the fittest'; there is a survival of all not too unfit.

But this does not mean returning whole-heartedly to an acceptance of Lamarck's proffered explanation of species-transmutation as caused by adaptive individual modifications and the inheritance and cumulation of these 'acquired characters.' Nor does it mean accepting exclusively the mutations explanation of species origin, despite the general agreement that mutations (rather large, immediately heritable variations) do occur and do make some new plant and animal forms. Nor, finally, does it mean seeing in the Mendelian juggling and recombining of unit characters in the case of hybridizations a sufficient explana-

tion of new species and adaptive specialization.

What it does mean is that, despite the much additional that has been learned confirmatory of the actuality of evolution, and the new wealth of knowledge that has been gained about the manner and mechanism of some of the principal basic factors of evolution, notably heredity and variation, biologists to-day are less agreed among themselves, or, better put, are more agnostic concerning the causal explanation of evolution now than they were just after Darwin and Huxley had made evolution a household word and natural selection its widely accepted explanation. Of course, natural selection, or Darwinism, never was a unanimously accepted evolution explanation. There were always Lamarckians; but after Weismann, the post-Darwinian champion of Darwinism who out-Darwined Darwin in his insistence on the *All-macht* of natural selection, had made his fight on the inheritance of acquired characters, Lamarckism went largely into eclipse. Yet there have always been Lamarckians since Lamarck, and are to-day, although there are but few who adhere to Lamarck's own naïve form of Lamarckism, with its assumption of the direct inheritance, in photographic replica, of bodily modifications acquired during the lifetime of the individual.

III

The Lamarckians of to-day are Neo-Lamarckians, with various forms of explanation of how parental modifications may cumulate in successive generations by heredity. And new examples of such claimed inherited modifications are every now and then put forward. Among the more recent and important of these claims are those of Kammerer of Vienna, whose accounts of his experiments in inducing changes by environmental influence in the mode of reproduction of various salamanders and in the color of various amphibians and reptiles, with a claimed definite hereditary transmission of these changes in later untreated generations, excited much attention at the last meeting of the British Association for the Advancement of Science. Also those of the Americans, Guyer and Smith, who have reported the positive inheritance of certain eye-defects induced in rabbits by a toxic serum, and whose unusually carefully conducted experiments and elimination of alternative explanations give their claims a very serious importance. And, finally, those of Pavlow the great Russian physiologist, whose white mice, trained to come to their food by the ringing of a bell, produced young who learned their lesson much more quickly, and in turn produced young still more quickly responsive to the signal. However many carelessly claimed instances of modification of species-character by an inheritance of acquired characters can be proved to be uncertain, and thus to be useless as evidence for the Lamarckian explanation of evolution, any single one that cannot be otherwise explained will have the gravest consequence in the search for the actual causes of evolution.

As a matter of fact, despite the inability of the Lamarckians, or of biologists in general, to offer any indubitable cases of Lamarckian inheritance (unless the most recently advanced cases are of this character), and despite the heavy weight thrown against the Lamarckian explanation of evolution by almost all that has been learned in the recent years about the physical basis of heredity — in spite of all this, many reputable and thoughtful biologists remain convinced in their own minds that any satisfactory causal

explanation of evolution, especially adaptive evolution, must contain as an important fundamental element some form of the Lamarckian assumption. There must be more than just chance variation in successive generations out of which adaptive modification and specialization are to arrive. Almost all the palæontologists believe, on the basis of their knowledge of animal and plant series extending through long periods of time, in some form of orthogenesis, or determinate variation. There must be something, they believe, that drives evolution on in more or less fixed lines, even though these lines lead, as they have led in the case of the crinoids, the ammonites, the great dinosaurs, and various other highly specialized lines, to over-specialization and extinction. Now unless the palæontologists accept some mystic inherent driving factor, such as the *élan vital*, or other, to explain this phenomenon, they must find in environmental influence and the impression on heredity of the changes caused by it, the explanation of the initiation, if not the maintenance, of this evolutionary movement.

Another fact of much significance in connection with adaptive evolution — a fact which I first stressed sixteen years ago in my *Darwinism To-day* — and which points strongly, to my mind, to some as yet unexplained means of introducing the acquirements of the individual into the heredity of the species, is that many of the inherited species-adaptations of plants and animals are in quite the same direction as the adaptive changes acquired in their lifetime by individuals of closely related species, which may well be the original species from which the newer more adapted ones have branched off. For example, in streams into which hot springs flow individuals of species occurring in the streams may, in the search for place and food, find themselves in warmer and warmer water, and may adapt themselves physiologically, sometimes with slight but recognizable structural changes, to high-temperature conditions.

But in the very hot springs themselves may be found species living which show, only in more marked degree, as definite and inherited species characters, the same adaptive changes as those shown by the individuals of the stream species which have found their way into the warmer waters. Similarly, the dwarfed growth of individuals of valley plant-species which have been planted on alpine heights is the same adaptive change as that which has been in some way acquired by typical alpine species, and is now an inherited characteristic of such alpine plants.

Altogether, it may fairly be confessed that evolutionists would welcome the discovery of the actual possibility and the mechanism of transferring into the heredity of organisms such adaptive changes as can be acquired by individuals in their lifetime. It would give them an explanation of evolution, especially of adaptation, much more satisfactory than any other explanation at present claiming the acceptance of biologists. For the truth is, as already suggested, that although we know much more about evolution than we did fifty years ago, and are more than ever sure of the reality of evolution, we are distinctly less confident concerning the causal explanation or explanations of evolution than we were a half-century ago. Darwinism (the selection theories) upset Lamarckism as an explanation; but the new knowledge of variation and heredity largely upsets Darwinism, at least as an explanation of species origin, and at the same time offers no satisfactory replacing explanation. Mutations and

Mendelism may explain the origin of new species in some measure, but they do not explain adaptation in the slightest degree.

IV

But it is not with the troubles of the biologists seeking the causes of evolution that the anti-evolutionists concern themselves, although it comes to me with constant surprise that they have not taken more notice than they have of these differences of opinion and questionings on the part of the biologists concerning evolution explanations. But they are not looking for any such small game. The thorough-going anti-evolutionists simply reject evolution outright; they dogmatically assert that there is no evolution; and let it go at that. From a letter just received from a friendly correspondent I quote the following sentences: 'So far as evolution is concerned, it is not an established fact. . . . There is not an established factor supporting it to-day. . . . Oh, how I wish we could get our schoolmen to drop this evolutionary nonsense!'

In answer to this the biologists assert that evolution is scientifically proved. They are quite willing to add that there are many puzzling things about it, the most puzzling thing being its causal explanation. Of course, the biologist might simply be content to say that evolution, like gravitation, exists; that it is a fundamental phenomenon of Nature, which can be described, but not explained. But gravitation can be described or defined in very few words. Evolution cannot be so simply and succinctly described. It has numerous manifestations; it is a complex thing; it is a group of many things. The evolutionist is concerned with the analysis of evolutionary phenomena and an attempt to relate a variety of effects to a satisfying cause. Here is where his puzzles and differences of opinion come in.

Also the relation of evolution to man has so far been a very much more complex and disturbing matter than the relation of gravitation to man. Its significance in relation to the very existence of man is pregnant with opportunities for trouble. Emotions, traditions, old beliefs, religion, and especially formal theology, are involved. Our anthropocentric system of world philosophy, outgrowth of centuries of self-worship, feels itself assailed. The reaction is one of anger and fear. Is man after all not a unique, specially created being, around whom and for whom an all-powerful Creator has produced the rest of life and the world? Evolution comes as the iconoclast to rob man of his sacred isolation. Repulse it; deny it.

This tempest created by a wounded, false self-pride seems unnecessary and rather absurd to the biologist. In the first place, he does not see man robbed by evolution of his high place at Nature's head. In fact, a belief in evolution confirms him in this place. He is still unique, the only thing of his kind or at all closely approaching his kind. His body is no less a wonder-exciting combination of matter and energy because it is composed of natural matter and energy, and is, after all, really a machine or group of machines, and not a mysterious something unrelated to the natural world. His mind is no less an endowment that lifts him far beyond all other living creatures because it reveals in itself basic elements common to the mentality of all life. Nor, finally, does an acceptance of human evolution deny the human possession of spirit, which we all know we have, however unagreed we may be as to how or when we came to possess it.

An evolutionist may be a good man, may be a profoundly religious man, as truly as may a philanthropist or a preacher. Being an evolutionist is not necessarily being any less a man. It is, indeed, being more of a man, if one characteristic of being completely human is the use to the utmost of that noble endowment of intelligence and reason which constitutes the chief special advancement and advantage of man over the lower animals. Evolution makes its appeal to reason, but its acceptance does not mean the abasement, let alone the denial, of emotion, faith, and religion, those great springs of the higher human attitudes and activities.

V

The evolutionist does not like being called a bad man. He does not like being posted as an enemy of poetry and faith and religion. He does not like being defined as crassly materialist, a man exclusively of the earth earthy. For, simply as evolutionist, he is not necessarily all or any of these unpleasant things. As individual he may be anything — as anybody else may be. I have known several bad men — one or two of them are in the penitentiary now — who were not evolutionists; who, indeed, even posed and were accepted as very good men, full of faith and religion. One was a Sunday School superintendent. And just as religion and cheating can apparently be compassed in one man, so can one man be both evolutionist and idealist.

What the evolutionist believes, on the basis of a mass of what seems to him unrefuted and irrefutable scientific evidence, is that the plants and animals and man and woman were not created by some sudden supernatural treatment of clay and ribs, but that they have slowly and gradually come into existence through the orderly processes of Nature extending over much time. He sees a fine and awe-inspiring order throughout Nature, some of which can be discovered and, in a measure, understood. He sees in this order, this immense capacity for natural being and doing and becoming, a beauty and majesty in Nature which cannot be transcended in conception. In recognizing the creation of man as its supreme achievement, he sees no belittling of man, but a proof of the extraordinary potentialities of this natural order. In organic evolution he sees just what the name signifies, the unfolding of organized matter, the outrolling of the possibilities of life.

Since the beginning of life on this earth this evolution has led constantly, even if slowly and with retrogressing side branches here and there, or extinctions, now and then, of unadapted or over-specialized kinds of creatures, ever onward and upward to higher life possibilities. It is a grandiose and noble sight which the evolutionist, surveying the natural occurrences of the many long geologic ages through which this earth has passed, as revealed to him by the testimony of the rocks and the accumulated results in the myriad life forms of to-day, sees spread before him. He sees life stretching in a long, continuous, and fascinating series of forms, from simplest, through more and more complex and amazing, to culmination in humankind. He sees even many of the details of the special perfecting of this humankind from its rough and still bestial beginnings of half a million years ago to its present high estate.

With all this in his eyes, is the evolutionist likely to be more blind than other men to the potentialities and possibilities of man himself? He knows no more than other men of the ultimate origin of life itself or of the

limitations or lack of limitations of evolution. He sees in evolution the explanation of man's origin and of the character of his present structural and physiological make-up. But of all that is the possession of man, or of all that is the possibility of man, he stands only on even footing with others to learn. If man lives in two worlds, one of his body and one of his soul, the evolutionist, like the rest of us, would like to know it. If imagination and love and faith and religion are something in man's life which are so different from the other things of his life as to call for some other explanation of their existence than the evolution that has given man the special form of his body and manner of its functioning, the evolutionist is not one who cannot be shown it. That there may be a God who has put his Spirit into men, the evolutionist can believe as well as anybody else. There is nothing in the conception of evolution to deny God, or to make man irreligious, or to lessen the aspiration of his soul.

With some naïve beliefs in an unnecessary interference with the observed order of Nature on the part of an anthropomorphic God, conceived as behaving in a manner quite too restricted to excite respect, the conception of evolution does cross swords. The evolutionist believes that the description of the origin of earth and life and humankind as given in Genesis is mythological, perhaps allegorical, at any rate not true as a literal account of these happenings. This, however, is something quite distinct from denying God or refusing to see in the Bible a guide to the highest of human conduct and an inspiration to the highest human ideals.

In a word, evolution and the tenets of the Christian religion are not in opposition. They have really little to do with each other. They concern themselves with essentially different affairs. For anti-evolutionists to encourage the popular error that they are incompatibles and even mortal enemies is a crime against both. It leads to an unnecessary and disastrous confusion in men's minds. It is a blow to human understanding of human life.

VI

The conception of evolution has had an enormous effect on our view and understanding of Nature. It has touched and colored all our natural philosophy. It has introduced irrevocably into our thought two fundamentally important ideas: those of continuity and transmutation in the things of the world. We find evolution, not as an isolated or particular phenomenon in Nature, but something all through and almost identical with Nature. All that we see of the make-up and behavior of living things constantly spells evolution to us. We see change always and everywhere, if we take the long view of Nature. What seems, in the short view, to be rest, or static, reveals itself, when the perspective is lengthened, to be movement, and dynamic. But that is precisely what evolution is: constant, slow, continuous change. Thus it is not too far-fetched to see an identity in Nature and evolution. Certainly that is the impression that the naturalist studying in any field of Nature, studying any phase of Nature, gets. Wherever or to whatever he turns his attention, he sees evolution. It is no wonder, then, that Nature and evolution come to be, to him, nearly synonymous terms.

This is an idea that has been growing on me with the years. More and more I have come to feel that our long-used meaning of evolution is too narrow. To the extent that we understand Nature we understand evolution, and

vice versa. There are many, many things about Nature that we do not understand. We do not understand the origin of life or the fundamental cause or causes of its constant flux. We lack a satisfying explanation of such highly specialized adaptations as the extremes of protective coloration, the nest-making habits of the solitary wasps, the extraordinary structural modifications and elaborate life-history of the complete parasites, and, even more baffling, those adaptive specializations which require for their utility very precise reciprocal modifications of structure and habit on the part of two different animal species, as two commensals, or on the part of a plant and an animal, as the orchids and the insects that cross-pollinate them. But these are precisely the things that are the outstanding puzzles in evolution. What we do not understand about Nature we do not understand about evolution; what we do not understand about evolution we do not understand about Nature.

So I want to plead for a wider conception of evolution, a conception as wide as that of living Nature itself. One of the obstacles to the acceptance of evolution has been its particularity. It has seemed to too many to be a special explanation of a few special problems in Nature. To a large part of the general public it has seemed chiefly an explanation of human origin which flies in the face of the Biblical explanation, and hence, by easy implication, is something that denies the Bible, God, and religion. But it is much more than this, and at the same time does not have all the significance attributed to it by the theologians.

It is living Nature, and the way that living Nature has become what it is and will further become what it will be.

Considered, and I think justifiably, in this large way, evolution is not to be denied so categorically and completely as my correspondent would deny it. To deny evolution in toto seems to me like denying the fact of life itself, life plastic, changing, adapting, perfecting; life not created once for all in rigidly fixed form, but developed and ever developing slowly, wisely, or at least as if it had wisdom, or was guided by wisdom, in the way and ways which lead to constant betterment. This is how evolution seems to me to be revealed by the study of Nature; this is what evolution seems to me to be.

Well, this is also what living Nature itself seems to be: a slow, mighty, constant movement of matter and energy, showing itself in ever-changing form and behavior, and revealing potentialities and possibilities that seem limitless. Man is a part of this Nature; hence, is endowed with these limitless potentialities. In this lies the basis of a religion of hope and inspiration. In whatever varying terms various ones of us name or personify the limitless potentiality of Nature and man, that need make no disturbing difference in our common acceptance of this fundamental basis of our religion. It need not make us less good or less honest. It need not undermine our belief in and practice of love and charity; it need not make us have lesser visions or smaller faith. It can magnify our conception of Nature, confirm our confidence in the limitless possibilities of life, and exalt our hopes for the future of humankind. Is this a form of religion to be banned?

plan. When these profits exceed $100,000,000 but do not exceed $150,000,000 the amount set aside is 2 per cent. of such profits; when the net profits exceed $150,000,000 but do not exceed $200,000,000 the amount set aside is $2\frac{1}{4}$ per cent.; when such profits exceed $200,000,000 the amount set aside is $2\frac{1}{2}$ per cent. No amount is set aside in any year when the net profits for the preceding year do not exceed $100,000,000.

It is my belief that this type of profit-sharing has come to stay. Indiscriminate disbursal of profits is being abandoned. This is a step in the right direction. The worker of mediocre ability will not approve of it, of course, but the man who has it in him to rise to an important position will appreciate the wisdom and justice of such a plan.

CARING FOR THE MEN'S SAFETY

A SUBJECT that has taken as much attention as stock subscription and profit-sharing in the minds of people interested in human relationships in industry is that of employee representation. Way back in 1908 the United States Steel Corporation inaugurated a safety campaign for the purpose of accident prevention. Part of this work lay in the building up of safety committees which consisted of representatives of the workers and management. More than 60,000 workers have sat on these committees. At the present, more than 10,000 employees are members of standing committees. These bodies meet at least once each month to make formal plant or departmental inspections, to review accidents, to suggest remedies, physical and operating, and to discuss safety matters in general. Full reports of such meetings, with recommendations are made by the committees. All new employees receive instruction in matters pertaining to the duties to which they are assigned and are warned of the hazards involved in the work and enjoined to exercise caution and to observe all the safety regulations which have been adopted for their protection. Their interest and coöperation is further solicited through the medium of departmental safety meetings which are attended by all the employees of the department, by safety rallies, motion pictures illustrative of safety and welfare work, and by bulletin boards and appropriate literature.

Frankly speaking, that is as far as we are prepared to go at the present time. We were the first to start committee work of this kind. Others have since taken it up and gone ahead to the point where workers have a voice in the whole management. I cannot subscribe to that plan. The worker knows his job; the management knows its job.

To invite a group of workers' representatives to discuss the plans of the corporation might be pleasantly sentimental and make good copy for newspaper consumption, but it is bad business and it isn't honest to either interest. Management knows that it alone can properly direct the work of the organization, and the workers know it. If both sides were honest they'd confess that each would rather carry on its individual work without the meddling of an amateur. A sharp line of demarcation must be drawn between the duties and responsibilities and powers of the directing body and the duties, responsibilities, and powers of the working body. Coöperation in industry does not mean backboneless socializing. It means the business-like, stern appreciation by each man of his own obligations and of the duties and rights of every other. It means sportsmanship to the extent that every man is willing to acknowledge the ability of a superior by reason of education and experience, but that the latter takes no unfair advantage of the other. That understood and illustrated in the daily life of an industry, there is no need of building up something which at best is a pretence. The honest employer knows in his heart that he will not turn management over to labor, and the wise worker knows that no employer would find it efficient to do it. But if the employee becomes a stockholder, then he becomes also one of the employers although continuing to be an employee. Any plan to be permanent and satisfactory must be fair and reasonable and based on principles that are logical.

World's Work June 1924

The Human Future

By VERNON KELLOGG

IT WAS in the first week of this year. Leaving my comfortable chair in the parlor car I walked leisurely through the train, swift, luxurious, safe, to the dining car, shining with its silver and white linen. Making selection from the long list of proffered foods I sat idly waiting for the first course, the oysters from Cape Cod or the "fruit cocktail"—pathetic name—made of bananas from the West Indies, oranges from California, and pineapples from Hawaii.

I glanced about the car, letting my eyes rove with mild curiosity over the many faces. They were mostly pleasant, intelligent faces of successful Americans, taking all this comfort and luxury as a matter of course. Then I picked up again the dinner card, and discovered something on it besides the list of things to eat.

The managers of the great railway had had provided for the diners, by an anonymous author, a cheering message in tone with the presumably optimistic spirit of the successful Americans who might read it. It was a New Year's greeting and message of that reassuring kind we so much like. It told us how successful we are now, and made happy augury for the future. It was soundly Rotarian. It was excellent for the digestion. This is part of what it said:

"We are living in a wonderful age. Some one has said that man made greater advancement in the last hundred years than during his whole previous existence.

"The Nineteenth Century was the greatest century of all time in material development, in mechanical invention, scientific discovery, and the application of natural elements and forces to the uses of man.

"But the discoveries and inventions of the first quarter of the Twentieth Century indicate that we are moving forward at a pace surpassing all previous records.

"The year 1924 will be another milestone of achievement along the broad road of everlasting time. That the same onward pace of progress shall be maintained must be our high resolve; for where there is no progress there is decay—without vision we perish."

Admirable, comforting, stimulating! And I, a scientific man, read into it a pæan to science. For this great "material development," this "mechanical invention, scientific discovery, and the application of natural elements and forces to the uses of man" is largely the contribution of science to the times, the nation, and the human race.

This is what has already come. But attend. The inspired author looks into the future, and, as clairvoyant, he sees the year 1924 to be "another milestone of achievement along the broad road of everlasting time." (Does our author also write movie leads?)

But this achievement is not to come unless we play our part. "That the same onward pace of progress shall be maintained must be our high resolve; for where there is no progress there is decay—without vision we perish." How true!

I finish an excellent dinner and go back to my comfortable chair under the electric lights in the parlor car. And I get out from my bag a little pamphlet which records some interesting statements made in a recent address by my friend, Julius Barnes, President of the Chamber of Commerce of the United States.

Mr. Barnes does not write movie leads. He writes clear matter of fact details that reveal impressively the specific character of the "onward pace of progress." He compares the crude comforts of only a generation or two past with the elaborate ones of to-day. He tells us of all the wonderful things we have now that we didn't have some time ago.

The independence of the United States was recognized in 1783. In that year, also, according to Mr. Barnes, was launched the largest ship the world had seen. (Some authorities make this ship a few years older. But no matter.) It was the *Victory*, Lord Nelson's flagship at Trafalgar, and was 186 feet long. There are ships now 1,000 feet long. (Perhaps not all of them carry Nelsons. But we shall come to that later.) In 1807 Robert Fulton's pioneer steamboat

the *Clermont*, first plied the waters of the Hudson. In 1829 there was the first railway in America; in 1830, the first sewing machine; in 1835, the first telegraph; in 1845, the first fast printing press, making possible the amazing American Sunday newspaper. In 1855 the first iron beam was used for construction, harbinger of the skyscrapers of New York. In 1870 there was built the first steel ship. In 1876 came the first telephone, and in this same year, only 47 years ago, the marvel of the Philadelphia Exposition, celebrating a hundred years of the United States, was the great Corliss engine, just designed, which ran the whole machinery exhibit. It was an engine of 2,500 horse-power, an engine of a power unheard of before. To-day we have electric generators, of pigmy size as compared with the Corliss, which generate 85,000 horse-power in a single unit. In the last quarter-century we have acquired automobiles, aëroplanes, submarines, X-ray and motion pictures, wireless telegraphy and radio.

What an astounding and gratifying exhibit! And what a revelation of the ever accelerating rate of our progress as it concerns industry and applied science in general! What may not happen in the next quarter-century?

No wonder that the President of the United States Chamber of Commerce sees a roseate present and a roseate future of the American nation and, indeed, of the human race. For in this amazingly swift development of applied science and industry, and the great heightening of our standards of living as a result of it, he sees the kind of evidence and the sufficient amount of its kind, which, to him, and to many more of us, warrant the most favorable auguries for the human future.

A GLOOMY PROPHET

THE reading of this little pamphlet further helped my digestion. But then I made a mistake. For I took out from my bag another piece of literature, a new book called "Mankind at the Crossroads," written by a biologist of Harvard University, and crammed, like Mr. Barnes's pamphlet, with a wealth of facts and figures to support the author's thesis. But while the thesis of the pamphlet is a reassuring one, the thesis of the book is a disturbing one.

Professor East, the book's author, also, like Mr. Barnes, looks to the human future, but his gazing into the crystal conjures up a different picture, of a different color, from that seen by the man of affairs. It is a picture of dark clouds, impending trouble, a bitter struggle for food, a deteriorating human inheritance. And the Harvard crystal-gazer is not the only one to see such pictures. Other biologists and anthropologists and psychologists and sociologists tell, in other recent books, of seeing similar pictures. And they record a saddening lot of gloomy prognostications.

Why this difference between the sooth-saying of the President of the Chamber of Commerce and the anonymous railway author and that of the Harvard biologist and his various scientific colleagues? The clue to the answer lies in that just-used phrase "human inheritance."

The word inheritance has come to have a double meaning in connection with human affairs, and hence its use is clouded by some misunderstanding. We speak of inheritance in connection with the passing on from group to group and from generation to generation, by teaching, precept, and example, of acquired and accumulated knowledge and customs and beliefs. This is social inheritance. Through it man is capable of transmitting knowledge and ideas, by various means, to such an extent that, as Julian Huxley has put it, "the experience of Moses, Archimedes, and Charlemagne, of Jesus, Newton, and James Watt is modifying our behavior of to-day." But we speak also of the inheritance by children from parents and ancestors of eye and hair color, of bodily size and facial contour, of resistance and non-resistance to disease, of general mental capacity and of particular mental traits; in a word, of inherent physiological and mental characteristics. This is biological inheritance, or heredity.

These two kinds of inheritance are fundamentally different and play different rôles in human evolution. One, social inheritance, is extrinsic, environmental. The other, biological inheritance, is intrinsic, fundamental. Human social inheritance was made possible only by the reaching, in the course of human biological evolution, of a stage when speech and then picture-making and writing became possible to man, and ideas and information could be passed on from group to group and generation to generation. The value of these ideas and this information depended and still depends on intrinsic brain development and

mental capacity. A human group of high inherent capacity can develop and maintain a highly useful societal evolution. A group of low capacity cannot. Inherent human capacity is the result of biological evolution. But the form of achievement on a basis of this capacity, and the acceleration of the possibilities of achievement, are largely the result of societal evolution.

ARISTOTLE AND EDISON

THE difference between the early Egyptians and Greeks on the one hand and modern man on the other, is a difference in societal evolution. Modern man is not better endowed with body or brain than were the great men of Greece, but he is better endowed with accumulated knowledge and the material results of the applications of science, and he can achieve much more than the Greeks could in those lines of human activity depending on accumulated scientific knowledge and perfected instruments of power and precision. Similarly, the marked differences among living groups of peoples in the extent to which societal evolution has gone are recognized by us in classifying a whole range of cultures, from those of "barbarians" to those of "civilized" peoples. Some of these barbarians may have an inherent capacity for a considerable social development but, for one reason or another, relating usually to opportunity, have made no such development. The Maori children of New Zealand have shown a marked aptitude in the schools established by the British colonists, some of these Polynesian pupils doing quite as well in their class work as their Caucasian school mates.

But, under any circumstances, a high stage of societal evolution can only be reached and maintained on a basis of inherent heritable human capacity, in other words, by good human stock. Hence, at bottom, human progress, the human future, rests on the character of our biological status and evolution.

Now, is it well with this biological situation? And, especially, with its future? It is precisely because of doubts, or of uncomfortable convictions about this, that the biologists write their gloomy books.

Karl Pearson, the vital statistician of the University of London, declares that one half of each of England's new generations are being produced by one fourth of England's population, and by that particular fourth which is most poorly endowed by both biological and social inheritance. Sir George Newman, chief medical officer of the Board of Education in England, has recently published figures (for 1922) showing that more than 40 per cent. of the children in the elementary schools of England and Wales are defective in some degree. Less than one sixth of the pupils of the thirty-eight rural schools in a certain West Virginia district are physically normal, according to the report of the district medical inspector. Of course, by no means all of these defects are hereditary. But many are.

The psychological examinations of more than one and a half million soldiers of the American draft in the Great War showed that about 75 per cent. of them had a native (heritable) mental capacity insufficient to enable them to carry through successfully a full high school course. Two per cent. of them were, indeed, so mentally incapable that they could not safely be recommended for regular military duty.

PHYSICAL, MENTAL, AND MORAL WRECKS MULTIPLYING RAPIDLY

OUR ever-growing altruistic activities, many of them dictated more by emoion than by intelligence, make possible, and even encourage, not only a persistence but also a multiplication of the physically and mentally defective in our population. The Jukes family which had provided, even many years ago, 300 professional paupers, 440 physical wrecks from debauchery, 50 prostitutes, 60 habitual thieves, 7 murderers, and 130 other convicts out of a total of 1,200 identified descendants and had cost the State of New York more than a million dollars for the care of its criminal, defective, and immoral members, goes on multiplying, as do the similarly notorious Kallikaks, Nams, Pineys, Zeros, Hill Folk, and descendants of Margaret, Mother of Criminals.

Goddard's study of the Kallikaks through six generations revealed two lines of descent from a single individual of good stock who became the father of an illegitimate feeble-minded son by a feeble-minded girl, and later married a normal woman by whom he had normal children. One of these lines, which we may call Line A, was vitiated with feeble-mindedness, the other, Line B, was not. I[n] 480 individuals of Line A, during five g[en]

erations, only 46 were known to be mentally normal, 82 died in infancy, 291 were of a mental status doubtful or unknown, 143 were feeble-minded, 33 were notoriously sexually immoral, 24 were confirmed alcoholics, and others were defective or criminal (frequently both) in various ways. As contrasted with this, of 496 descendants in five generations in Line B, all but one were of normal mentality and there were no epileptics or criminals. Now with all recognition of the assistance that environment may have played in determining the fate of these individuals it is evident—is it not?—that biological inheritance has counted enormously in producing the determination of this fate.

Another societal problem in America—and there is a similar one in South Africa—which has an important biological aspect, is the Negro problem. The new migratory movement of the Negroes within the country which has brought within the last three years more than a million of them from the Southern states into the North, and the steady increase, revealed by authoritative statistics, and in some measure due to this movement, of Negro-white mating, presents another biological situation tending to reduce the American average mental capacity. The Negro problem is, in origin, an immigration problem, and even to-day it remains such in part, as we are continually importing Negroes from the West Indies. The National Association for the Advancement of the Colored People declares that in 1913 it defeated bills in eleven states out of twelve which aimed to prevent Negro-white intermarriage. This may have helped the "advancement" of the Negro, but what has it done for the future of the American race?

A WORLD WAR FOR GOOD

FINALLY—not because it is the last of the problems, but because of my limits of space—there is the problem of the relation of food supply to the growing world population. This is the special subject of Professor East's book. He sees in man's cumulating increase in numbers, and in the definite limitation of the world production of food, a situation calling for serious attention; that is, if we are truly interested in the human future and willing to look a few scores of years ahead instead of just a decade or two. In the Nineteenth Century the world doubled in population. At the present rate of increase it will double again in sixty years. Can the food supply increase at that rate? How soon will it take unbridled breeding to bring the race face to face with such an imminence of famine as to produce a bitter internecine struggle for food horrible to contemplate?

But if there is something dangerously wrong with the present conditions and tendency of our biological evolution, can we do anything to remedy them? Is not biological evolution a blind and ruthless force which has all organisms in its power, determining their fate without regard to their will or efforts?

Why not face the situation squarely and boldly? We tend to dodge the facts and the talking about them. They are not "nice." But why gag the people who talk about our selective birth-rate and about the desirability of birth control? Why laugh down a good word for a good idea because the abuse of cranks has given eugenics over to the tender mercies of the comic press and comic stage? From the days of Plato to Galton and on to to-day wise men and lovers of their race and nation have recognized the value of eugenics. One thing is sure: if we don't have eugenics we shall have dysgenics. And dysgenics is bad for the race, bad for the human future.

But we do not need to have a bad biological future—which is the real basis of the whole of our future. We can prevent it by commonsensible and vigorous action in so modifying our social organization and practise as to assure the kind of biological evolution we want. We have used the facts we know about physics and chemistry to create the comforts and luxuries that the President of the Chamber of Commerce lists in his address. Why not use the facts we know about biology to create ever-bettering human stock? We can do things by education and legislation about immigration, about the multiplication of hereditary defectives and delinquents, about the Negro problem, that will prevent the further dilution and discoloring of American blood.

Man can determine his own evolutionary future. He is unique among organisms in possessing this power. Happy—but responsible—position. What is he doing about it in the world? What are we doing about it in America?

"Without vision we perish," writes the anonymous author of the dining car message. How true!

Planning the Upkeep

X. THE GENERAL WELFARE

A Trend Away from Selfishness Toward Service: To Be a Regular Program, Not Incidental Business

By WILLIAM McANDREW

THIS is the last of ten investigations into provisions for maintaining the American State. Guizot enquired of Lowell, "How long do you expect your republic to endure?" "So long," was the reply, "as the ideals of its founders are maintained." These ideals the men who made us a nation put into our two fundamental instruments, the Declaration and the Constitution, enumerating our rights and duties as equality, life, liberty, happiness, union, justice, tranquility, defense, and general welfare. To maintain these they proposed a system of public schools supported by taxes from all people whether they had children or not. This was revolutionary. Education had been developed for the benefit of those who received it. Our founders adopted it as a public not a private benefit.

The old idea persists. Five citizens appearing before a committee of the legislature at Albany to advocate improvement of the schools of New York are upset by the charge that none of them have any children. This is nonsense. Advocates of prison reform need not have children in jail. Prisons and schools are for public benefit, not for parents. Law and taxation so establish. School superintendents often ignore it or forget it.

There is before me a printed invitation of a superintendent of a large school system urging every child completing the elementary school to go to high school. "You cannot succeed in life unless you are educated," the exhortation reads. Then follow tables showing how much more the yearly wage of high school graduates is than that of those who do not attend. That was a common lure of the schoolmaster before the war. "You study hard, and you'll get ahead" was the promise held out. The generation of 1910 was encouraged toward school work by money, medals, and mention. The highest rated graduate received the title "Valedictorian" and, to him, the doubtful glory of delivering an oration mostly his teacher's work. Honor rolls were painted on school walls feeding the self-esteem of the children thus marked but with no established beneficial effect upon the citizens who paid for the paint. Scholarly mottoes: "per aspera ad aspera," "palma non sine labore," "knowledge is power" based on selfishness flavored school procedure notwithstanding the founders of the Republic had proposed public schools for public and not private ends. Horace Mann preached fervently against the prize and prominence system. Half the school principals in New York City are opposed to it. Chicago schools unanimously discard it. Henry Snyder, Superintendent of Jersey City schools called it "a European abomination" and desired the children taught that they come to school for precisely the same reasons that they would join the army: to serve their country. Joy Morgan who edits the *Journal* of the National Education Association repeatedly tells us that service not self is the only honest object of schools supported by general taxation. Fred Hunter, Superintendent of the Oakland Schools, issues to all teachers a bulletin called "otherness" to bring out the fact that the schools are a part of the organization set up by the Constitution to promote the general welfare.

This is different from the schools of Mr. Roosevelt's day. He said that not once was it brought home to him through all his school days that the money devoted to the school was not for his benefit but for the community. How well the pre-American theory of education sticks one may find in reading

Boll's Bulc - March 1925

Bad Bugs and Good Bugs

By VERNON KELLOGG

THERE are more kinds of international exchanges of living things than those of tourists, professors, and prize-fighters. For example, less known popularly, but more important economically than any of these, is the exchange of bad bugs. Bad bugs cost us more than a billion dollars a year in losses to our field, orchard, and truck crops, our forests and our animals and animal products. And not all—in fact, not most—of the worst of these bad bugs are of our own raising. They are immigrants. Of the worst fifty insect pests that harass the grain and cotton growers and truck farmers and orchardists and stockmen and millers and housewives of our country, more than three fifths came to us from foreign lands.

The codling moth that eats our apples came from southeastern Europe. From Europe also came the gipsy and brown-tail moths that strip the leaves from orchard and forest trees in New England. The boll weevil that spoils the cotton came from Mexico. The San José scale that ravages deciduous fruits came from Japan, and the cottony cushion scale that threatened to wipe out the oranges of California came from Australia.

The Argentine ant, the worst house pest in the Southern states, came from South America. The unpleasant Croton bug, of which the population in New York City exceeds by several billions the few million human inhabitants of that proud city, came from Germany. The cabbage butterfly, that limits the German-American sauerkraut, came from Europe by way of Canada. The ox warbles that ruin the hides also came from Europe. The chinch bug that revels viciously in the corn fields of the Mississippi Valley probably came from tropical America, and the Hessian fly, which is a potent contributing element in the wheat farmers' woes, and hence in American politics, is believed by American entomologists to have been brought over—let us admit unintentionally—in the straw for their horses by the Hessian mercenaries of the Revolutionary War.

However, the balance in this international exchange of bad bugs is not all one sided. We sent, some way, to France in the 1860's, the grape phylloxera, native of New England, and most dreaded of all pests of the vine. And then France, in the belief that turn about is fair play, sent it to California. Millions of acres of French, not to say Spanish, Portuguese, Swiss, and Italian vineyards were destroyed before the remedy was found. That remedy, oddly enough, consisted in sending to Europe, again from New England, the naturally resistant roots of native grape kinds, on which the European wine grape kinds could be grafted.

There are undoubtedly some other native American bad bugs, which have invaded other countries to help balance accounts in this curious international exchange, but there are not many; certainly not nearly so many as the foreign bad bugs which have found their way to us as immigrants. If it were not for what the phylloxera has done and what the Colorado potato beetle may do, we might feel that we had had altogether an unfair deal in this exchange. But let us trust to the beetle!

Of course, we are not sitting quietly with folded hands in connection with this unpleasing sort of immigration. We have a very active Federal Horticultural Board, which has its sharp-eyed agents in most of our major ports as well as scattered along the Canadian and Mexican borders. They watch for the foreign bad bugs coming in or on incoming nursery stock and bulbs and seeds and

fruit, and they fumigate and burn with hard-hearted assiduity. And so do the European and other nations watch at their borders for unwelcome six-legged immigrants. There are immigration laws for insects as well as for humans. But there are no quota allowances for the bad bugs. They are not even sent back home. They are just simply—murdered.

THE SMUGGLING OF BUGS

BUT before they can be murdered they have to be discovered. And they have such a variety of ways of smuggling themselves in that this is no easy matter. They hide themselves in the soft flesh of fruits and tubers or in the harder flesh of bulbs or in the still harder substance of grains and seeds; they lie, all dark and silent, in the soil around the "balled" roots of imported nursery stock; or they boldly cling to the stems and leaves of cuttings and potted plants, sometimes relying upon a bizarre appearance to save them from recognition.

The many members of the whole great family of "scale" insects—among which are hundreds of terrible pests of orchards and berry patches and forest and ornamental trees, and which are unusually well represented among the bad bug immigrants to our shores—would not, to the untrained eye, reveal themselves as insects at all. Almost all of them are small and flat, and the females of many kinds have no wings or legs or eyes or feelers, the body being simply a little flattened sac provided with a tiny sucking tube by means of which they both hold fast to their plant host and rob it of its sap, which is the only food they take. Some of them cover their degenerate bodies with small, flat scales of white or reddish or dark-colored wax which at once protects and conceals them. Thus disguised, they may come even to our very breakfast tables, seeming to be nothing more than brownish specks on the skin of oranges. But if the oranges know anything they know better than that. At any rate, the orange growers of California and Florida know, from hard experience, much better than that.

Some of these bad bug migrants associate themselves so closely to man that they have become as widely distributed over the world as has man himself and are entitled to be called cosmopolitans. Especially is this true of the household pests such as the housefly and stable fly, bed-bugs, lice, cockroaches, and clothes moths, all of which live in close—too close—contact with man and go wherever he goes, by caravan or railway or ship. It is almost impossible to maintain an effective quarantine against these pests. It would almost mean the stopping of human migrations.

In trying to prevent the incoming of bad bug immigrants the quarantine has to be directed primarily against the plant or animal host of the insect pest. The insect migrants chiefly travel in or on the bodies of their hosts. The importation of cuttings or fruits of a given kind of fruit-tree affords opportunity for the insect pests of that kind of tree to come with them. The pea and bean weevils travel in dried peas and beans. The pests of live stock come in with imported animals. Various grain pests travel in the seeds or straw. And so on.

Many insect pests live in or on only one kind of host. The means, then, of keeping out such a pest is to set up a quarantine against this specific host. Others may be able to live in or on any one of a long list of hosts. There are specific pests of apples. But there are other pests which attack a dozen different kinds of deciduous fruits. Naturally they are more difficult to keep out. Constant vigilance is the price of safety for our leagues of fields and orchards and forests. Any relaxation of this struggle may spell national calamity.

PREPARING A RED-HOT WELCOME

THE sleepless heads of the United States Bureau of Entomology and the Federal Horticultural Board, Dr. L. O. Howard and Dr. C. L. Marlatt, with their hundreds of fighting assistants and coadjutors, do not simply wait to be surprised by some new bad bug immigrant finding its way unexpectedly to our shores.

They keep a sharp eye out to see what the worst pests are in those lands from which we stand most chance of receiving unwelcome visitors. And they quarantine in advance against the plant or animal hosts with which these visitors may most probably come. The inspectors at our ports and along our borders are informed, and they prepare a poisonous or red-hot welcome for them.

For years a little fly, called the Mediterranean fruit fly, probably the worst and most widespread of all general fruit pests, has been hovering in the offing, which is to say, the Bermudas, Hawaii, Brazil, Spain, France, and elsewhere, waiting for a good chance to come to us and enjoy our compelled hospitality. But forewarned, forearmed; and so far it has been unable to make successful landing, thanks to expert and ceaseless vigilance. If it should ever get well-established in this country—well, bang! would go millions.

A CONTINUOUS WAR OF NATIONAL DEFENSE

"The enemy at the gates is numbered by millions. It is a modern instance of Horatius at the bridge. If Horatius should be overwhelmed there will be disaster for us all. It will not be the spectacular disaster of an army in flight or a besieged city conquered. It will be just the drab disaster of not having enough to eat. The enemy will eat and we shall starve."

But quarantine is enforced not only at national borders but also at state borders. The brown-tail and gypsy moths have been restrained, by internal quarantine regulations and a steady fight all along the borders of their New England range, from spreading over the whole or a large part of our country.

In 1916 a bad bug immigrant from Japan, known as the Japanese green beetle, turned up, curiously enough in New Jersey, where it was found to be infesting an area of about one square mile. It is an omnivorous feeder, attacking the foliage of many kinds of plants, including fruit trees, small fruits, garden crops, and ornamental trees and shrubs. In addition, its larvæ (grubs) feed on the roots. It is a strong flyer and, besides, gets readily carried about by various agencies. It has been found audaciously clinging even to the clothes of pedestrians and motorists. Before the full danger from the pest was adequately realized it managed to extend its area of infestation until by the end of 1922 it had got over into Pennsylvania and was spread over 773 square miles in the two states. Since then it has been actively fought, and strict quarantine regulations are in force in order to prevent its spread with nursery stock to further fields of pleasure.

Another recent bad bug immigrant, this time from Europe, which has smuggled itself into this country and gained a strong foothold in several northeastern states and even as far west as Ohio and Michigan, is the European corn borer, a plainly dressed and unimportant-looking moth, whose larva (caterpillar) bores into the stems of plants of various kinds, with a marked preference for corn and particularly sweet corn. It undoubtedly got into this country by hiding in the stems of imported cultivated plants. As a new menace to this country's "walls of corn," it is attracting the lively attention of economic entomologists and quarantine officers—not to mention that of the corn farmers of the Middle West. It is already listed by the Bureau of Entomology as one of the most dangerous of our bad bug immigrants, although probably more because of its potentialities than because of its so-far-realized achievements.

But for these two bad bugs that have outwitted the quarantine agents at our national borders there have been hundreds which have been caught in their smug-

gling efforts and summarily checked. The Federal Horticultural Board publishes a report each year of the "important foreign insects collected on important nursery stock," and these lists are long and portentous. They reveal a concentrated attack, as it were, of foreign enemy pests on American crops. The number of kinds of these bad bugs that try to get in, and the number of foreign countries from which they come, are amazing. A recent list records nearly 1,500 species of insects (not necessarily all serious pests) from ninety countries (colonies reckoned as distinct from mother countries)—a truly terrifying showing. But it is at least satisfying to know that these particular attempts at invasion were checked, and by no tender means. For example, the report states that two large shipments of broom corn arriving from Hungary were found to carry a large number of living larvæ of the European corn borer. Therefore "as a condition of entry this corn was carefully sterilized with live steam, preceded by a vacuum." Not a comfortable procedure for the stowaways!

IS YOUR TOWN EDIBLE?

THESE lists reveal, too, some of the multifarious schemes adopted by these bug immigrants in their attempts to get by. In certain innocent-looking packages of cotton seed were found living larvæ, chrysalises, and adults of the pink bollworm, a notorious cotton pest. Even a collection of souvenirs arriving in New York from St. Kitts packed in cotton lint was found to be harboring larvæ of this pest. Hiding in soil packed around the roots of some plants brought from Brazil were found living specimens of the most destructive termite (white ant) in the world. This termite, when represented in sufficient numbers, can simply eat up a whole town, if the buildings are of wood.

This mention of "sufficient numbers" brings up an interesting question: How is it that the bad bug immigrants which get over our national borders only a few at a time are able to maintain themselves in their new home and to increase so rapidly in numbers as to become, very soon, a menace to the very existence of our grains and fruits and vegetables? Part of the answer is simple; part, less so. Granted suitable life conditions, the rate of reproduction of most insects is such that only a few years, in some cases only a few months, are needed for an increase in numbers from dozens to millions or billions. Most insects lay many eggs; and most insects run through one to several generations a year. Hence their multiplication, which moves by geometric progression, is a thing of brief time and large results.

NECESSARY FAVORABLE ENVIRONMENT

BUT I have said "granted suitable conditions." That of course is a *sine qua non*. An insect kind which can live only in the tropics, or only on a single kind of host which does not grow in the United States, does not find "suitable life conditions" when it comes here; it never gets even a start. But when it finds climatic conditions favorable, and its special host plants or animals abundant, it can more or less readily establish itself over here and flourish quite as well as in its native land. Indeed, often better. And for this reason: Usually a foreign insect pest arrives in our country without those active enemies which practically all insects have in their native homes. Most of these enemies are other insects, predacious and parasitic insects, which live at the expense of the pest insects. So when the bad bug immigrant comes in without its good bug checks, and finds a pleasant climate, as in California or even—for some insects—as in New Jersey, and a table bountifully spread with food—which means great grain fields, thriving orchards, well-cared-for truck gardens, and numerous herds and flocks—the bad bug immigrant lives joyously, multiplies abundantly, and becomes a menace to our national prosperity. This opens a new chapter in our story of unfamiliar international exchanges.

The nations cannot and do not stop simply with trying to keep out bad bug

immigrants. They recognize that some smuggling constantly goes on, and that a lot of very bad bugs have already found their way across national borders and are well established in their new homes. So an international exchange of good bugs has been instituted.

A good bug, in my present meaning, is one that fights a bad bug—in other words, is a predacious or parasitic enemy of the bad bug. The international exchange of good bugs has been set up on the basis of the facts, some already recited: (1) that all bad bugs have special bug enemies in their native habitats, (2) that bad bug immigrants usually arrive in their new homes without their accompanying parasites, thus being able to increase in numbers with terrifying rapidity, and (3) that these parasites can be found in the native homes of the bad bugs and introduced into their new homes, to go on with their beneficent work of keeping the bad bugs in check.

When the cottony cushion scale, that came to California from Australia about 1868, increased to such numbers as literally to threaten the entire Californian orange industry, an American entomologist went to Australia and sent back a few little tin boxes full of small lady-bird beetles of a kind which he found to be a confirmed devourer of cottony cushion scales. In fact, apparently it eats nothing else. These little predacious beetles increased with extraordinary rapidity—there were so many cottony cushion scales in the California orange orchards ready to be eaten and converted into new beetles—and had soon so much reduced the number of the scales that the pest was practically under control and has never since been able to cause serious damage to the orange trees. Since then the beetle has also been artificially introduced into other orange-growing countries—New Zealand, South Africa, the Hawaiian Islands, Portugal, southern France, Italy, Syria, and Egypt—everywhere it has repeated its successful attack on the scales.

The success of this experiment was so striking that it led to a great development of this way of fighting immigrant bad bugs and now the international exchange of good bugs has become one of the most important practices in modern economic entomology. The European browntail and gypsy moths are being fought in this way in New England, more than thirty species of imported parasites having been tried out against them, with much success in some cases, although little or none in others.

In Hawaii a small leaf-hopper of Australian origin which attacks sugar cane became so abundant in the first decade of the century as seriously to threaten the very existence of the great sugar plantations of the islands. Two entomologists were sent to Australia to look for its parasites. Consignments of several different kinds were sent back and, after being allowed to increase in confinement for a time, the parasites were liberated in the plantations. Some of them began to multiply rapidly and the leaf-hoppers to decrease correspondingly. In 1907 one large plantation whose crop had dropped from 10,954 tons in 1904 to 1,120 tons in 1905 and to 826 tons in

BUGS THAT HAVE COME TO US FROM ABROAD

The Boll Weevil, from Mexico
The San José Scale, from Japan
The Croton Bug, from Germany
The Green Beetle, from Japan
The Corn Borer, from Europe

BUGS THAT HAVE LEFT FOR FOREIGN LANDS

The Potato Beetle has invaded France
The Woolly Apple Aphis has invaded Europe

1906, produced 11,630 tons, a result almost entirely due to the good work of the imported parasites.

JAPANESE VS. ITALIAN

IN ITALY a degenerate little immigrant scale insect that feeds on mulberries had so increased in numbers as seriously to threaten the complete extinction of the mulberry trees and consequently of the silk industry of the country. But a minute parasite of this scale introduced by an Italian entomologist from Japan and America conquered the pest and brought about its approximate extinction throughout a large part of Italy.

But fighting pests with parasites is not all so simple or so successful as these selected examples of the process would indicate. Sometimes, indeed often, the introduced parasite seems to be unable to get a strong foothold in its new home. Sometimes, unless it is of a kind which attacks only a single host species, it lets its attention wander in its new home to other native insects and does little or no harm to the special bad bug it ought to fight. Sometimes it brings along with it its own parasites, for

> Great fleas have little fleas
> Upon their backs to bite 'em,
> And little fleas have lesser fleas,
> And so ad infinitum.

These secondary, or hyper-parasites, may not only keep in check the imported parasites but may also spread to other useful native parasites and, by checking them, do more harm than good. Or the introduced parasites may be attacked by native hyper-parasites and thus never get a chance to do the good work they are brought in to do.

Sometimes, too, a parasite may require two kinds of hosts in which to complete its life history and the second host may not be present in the new home of the introduced parasite. On the other hand, a parasite introduced to fight a particular bad bug immigrant may fight not only that immigrant but also some other native bad bugs and thus multiply its beneficence. Thus, Dr. Howard states that a certain parasitic fly introduced, under his direction, to fight both the gypsy and brown-tail moths has already taken kindly to a large number of American hosts and has become an apparently important parasite of more than twenty species, of which at least half a dozen are of much economic importance.

DANGERS OF IMPORTING THEM

ALTOGETHER this matter of the international exchange of good bugs to fight bad ones is one calling for much study and not to be undertaken with the confidence of ignorance. Tampering with the "balance of nature" is something not to be indulged in recklessly. The importation of the mongoose into Jamaica and the rabbit into Australia are the classic examples of the uncomfortable surprise that may be in store for the well-intentioned rearranger of zoögeography. If the entomologists are not careful we may have another classic example in the case of the introduction from one country into another of some presumably good bug that may go wrong in its new home.

But we may trust the entomologists to be careful. They will be, if they are good entomologists. And there is no doubt at all that they have done and are doing some very useful things through their international exchange of good bugs as an offset to the international exchange of bad bugs which goes on constantly, in some degree, despite all our quarantines.

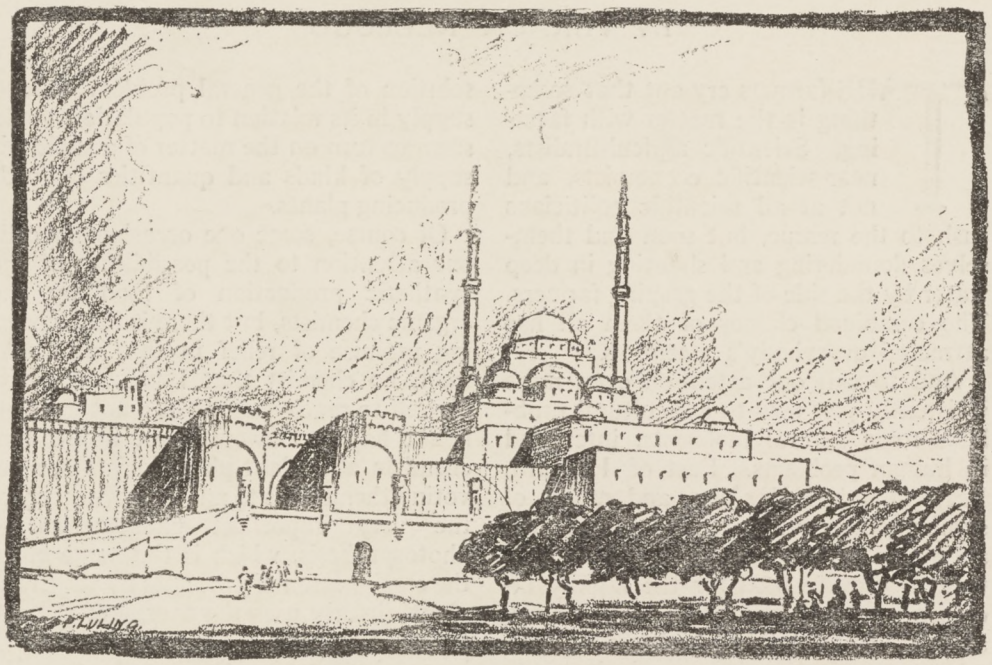
The insect-fighting entomologists of this country are waging a continuous war of national defense. There are not many of them and the enemy at the gates is numbered by millions. It is a modern instance of Horatius at the bridge. If Horatius should be overwhelmed there will be disaster for us all. It will not be the spectacular disaster of an army in flight or a besieged city conquered. It will be just the drab disaster of not having enough to eat. The enemy will eat and we shall starve. Let us wish all power to the arm of Horatius.

retreat before Moorish bands. France is storing up trouble for herself by raising an Arab army equipped with the latest weapons and trained to use them.

The British people are holding an immense Oriental empire with only small forces. Looking at these problems of the East with only a tourist's eye, as I have lately done, it is clear that the Oriental peoples cannot be ignored, treated unfairly, or held by weakness. The Egyptians have 7,000 years of history behind them, but they have a future as well as a past; and everywhere the East stirs uneasily.

These old peoples cannot acquire independence in a year or two, or a century or two. Only by a very slow process of education will they be capable of self-government, and equal to the greater difficulty of controlling races not so far advanced as themselves, like the Sudanese and the Nubians, with justice and fair-dealing. For the peace of the world and the security of primitive folk, England must go on with her job of policing the East, irrigating, administering justice, maintaining order, guiding native officials, preventing corruption as far as possible, checking cruelty.

It is an imperialism which is not in favor with the democracies of the West, or with the British taxpayer in the back streets of English cities. But if the British now abandon their policy of imperialism out of weakness—as the Romans eventually tired of their colonies, and withdrew under the pressure of political and financial troubles—there would be the devil to pay. It would be the devil of flaming war and bloody anarchy from the Mediterranean to the Indian Ocean. The map of the world would be changed again by a new convulsion of races and powers.



THE GREATNESS OF ISLAM

The fatalism and fanaticism of the faith of Mohammed may well have held Egypt stationary for centuries, and its symbols in the mosques of Mohammed Ali and the Sultan Hassan still dominate the city from the heights of the citadel of Cairo.

By World's Work May 1925

When Cabbages Are Kings

With Population Growing Faster Than the Food Supply, Scientists Say the Time is Not Remote When Plants Will Rule the World. A Plea for an Expansion of the Vegetable Kingdom

By VERNON KELLOGG

THE farmers cry out that something is the matter with farming. Scientific agriculturalists, near-scientific economists, and not at all scientific politicians rush to the rescue, but soon find themselves floundering and shouting in deep water by the side of the gasping farmers. The combined clamor of them all has attracted everybody's attention.

And to call our attention even more insistently just now to agricultural problems come several biologists, interested in human problems. East of Harvard, Pearl of Johns Hopkins, and others of similar good repute express serious doubts about the continued adequacy of agriculture to provide food for the rapidly increasing population of the world. And, specifically, they have doubts about the adequacy of American agriculture to meet the demands that will be made on it by a few more decades of increase in the population of the United States, if this increase continues at its present rate.

East discusses at much length, in his suggestively named book, "Mankind at the Crossroads," this problem of the relation of food supply to population and ends with most gloomy prognostications. And Pearl in various papers and in a chapter in his even more suggestively entitled book, "The Biology of Death," adds more gloom to the picture. Both of these careful students declare that there is a real problem of food supply impending. If nothing is done about it pretty soon, it must become so acute as to lead to social dangers of serious proportions.

Now the basis of our food supply depends on plants—all flesh food goes back to plants for its origin. Therefore the solution of the general problem of food supply in its relation to population would seem to turn on the matter of a sufficient supply of kinds and quantities of food-producing plants.

Of course, some one occasionally calls our attention to the possibilities of the synthetic production of food by the organic chemists, but there is little cheering promise of relief in that way. At least, no chemist that I know commits himself to much more than a not too confident hope. However, not a few biochemists and plant-physiologists are devoting themselves to an intensive study of the very important phenomenon of photosynthesis, which is the name given the combination of processes by which the plant directly uses the energy of the sun to build up organic compounds out of inorganic ones; in other words, to make food stuff out of inorganic raw materials in the presence of sunlight. But so far these investigators are in the stage more of analyzing than of synthesizing.

NOT TOO EFFICIENT!

ONE thing, however, they are bringing out very clearly, and that is the extraordinary inefficiency of plants in capturing solar energy and making it of use to man. This criticism of the plant as an energy transformer comes as a dramatic surprise to most of us, who somehow get from our sketchy text books the impression that since the plant was about the only organism at work on this job of capturing solar energy for our use it was doing a 100 per cent. job. As a matter of fact it does about a 1 per cent. job.

Dr. H. A. Spoehr, plant physiologist of the Carnegie Institution's Coastal Labora-

tory at Carmel, California—located where it is because of California's promise of a large supply of sunshine—has recently declared that the sun pours energy on every acre of ground during an average ninety-day growing season, equivalent to the energy bound up in 1,476 tons of coal. Of this great wealth of power a crop of wheat, yielding fifty bushels to the acre—a yield rarely reached—puts into the bin from each acre an energy equivalent less than that stored up in two thirds of a ton of coal.

This is not a favorable comparison. And as our coal and oil deposits, representing sun power captured during long periods of time and stored ages ago, are being used up thousands of times faster than they were originally made, we shall pretty soon find ourselves up against the disturbing proposition of having to tap sun energy day by day as we need it. Plants are so far our only means of this capture, but, as already indicated, they can not work fast enough, and, besides, they must be increasingly used for food by our increasing population, and little can be spared of their energy supply for fuel. Hence it does seem necessary for science to devise an artificial way for the direct capture of some of the great quantities of solar energy that daily waste themselves around us. We need this energy for both food and fuel.

Dr. Spoehr is something of an optimist and believes that when science attacks this problem in real earnest it will be solved. In the meantime, however, we must trust to the plants. And this brings us back to our earlier statement that any immediate amelioration of the growing seriousness of the problem of food supply in its relation to increasing population must rest on an increase in the supply of kinds and quantities of food plants.

In quantity, the Federal and state governments must push on with their reclamation projects, their projects of irrigation and drainage, and use of cut-over forest lands, so as to increase our crop-producing acreage. And the scientific agriculturalist must get busy—he is already busy, but he must get busier—with his methods of increasing the yield per acre of grain and forage and vegetables and fruits.

TWO HOPES FOR THE FUTURE

AS TO the problem of kinds of plants, the solution has two aspects. One is to speed up what are popularly known as "Burbanking" methods, the production of new races of useful plants by hybridizing and selection. The other—a method which Burbank also uses—is to ransack the world to find edible plant kinds that are not already grown here, but which we may be able to introduce and establish as regular additions to the menus for ourselves or our domesticated animals. This picturesque performance is now going on in a well-planned way, and has been for a quarter of a century. The story of it is of fascinating interest to me. Perhaps it will be to you.

The fundamental scientific basis for this method is the knowledge, familiar to students of the geographical distribution of both plant and animal kinds, that many of these kinds are not now living in all those places in which they are able to live. If they were given some artificial help to cross the natural barriers of one kind or another which now restrict them to certain regions, some of them, at least, might find new regions entirely comfortable for them.

Familiar examples of the striking results of such help, coming from man, are afforded by the rabbits of Australia, the mongoose in Jamaica, and the English sparrow in America. Not many years ago there were no rabbits in Australia. But somebody thought it would be a good idea to introduce this playful little animal there for the sake of pleasantly diversifying a fauna consisting mostly of kangaroos and wallabies. The rabbit took kindly to living conditions in Australia, and for years now the principal interest of Australians in connection with rabbits has been how to get rid of them. The English sparrow—or, better called, European house sparrow, because it is no more English than German in its nationality—has never been able to cross the Atlantic:

but somebody brought over a few pairs and turned them loose in this country. That was all the chance the hardy, adaptable, and rapid-breeding little European pest needed. You know the rest.

Examples of this capacity of various organisms to maintain themselves in new places, if they can once cross the barriers that now restrain them in their present region of distribution, might be chosen from among plants as well as animals. Just as bad bugs have found their way, by one means or another, from Australia, Japan, South America, and Europe to our shores, and have been able promptly to make themselves at home here, and do a lot of harm, so have some bad plants. The blight that is wiping out our chestnut trees came from Asia. The field garlic that is causing millions of dollars of injury to our field crops came from Europe. So did the blister rust that is ravaging our pine forests, and the destructive Russian and Canada thistles, the latter coming in by way of Canada and acquiring its name on the way. In fact, probably two thirds of our worst weeds are of foreign origin.

But also just as some good bugs (parasites of bad ones) have been intentionally introduced from foreign lands and have been able to establish themselves here, and give us a lot of help, so have many good plants been similarly introduced and established. Many of our staple grains, vegetables, and fruits, such as wheat, beets, apples, and peaches, came originally from foreign lands. In fact the deliberate introduction of useful plants has been so valuable to the country that the Department of Agriculture maintains a special office of foreign plant and seed introduction with a considerable headquarters staff, together with a field staff of highly trained botanist-explorers who ever wander over the earth and send or bring back to America seeds and cuttings and rooted plants of kinds which seem to them likely to be able to live here and to provide new sources of food for our growing population.

Several special plant-introduction experimental gardens are maintained at various places, north, south, east, and west, where the new introductions are given a first try-out by trained horticulturists. And, finally, there is a collaborating group of ten thousand volunteer experimentalists, scattered all over the country, who aid in finding out whether the new plants can be grown here successfully on a commercial basis.

WEIGHED IN THE BALANCE

THIS plant-introduction office has now been in existence twenty-five years and in that time it has made more than 50,000 introductions. To be sure, the large majority of these have been tried and found wanting. That was to be expected. But enough have been such decided successes that the Department of Agriculture feels itself warranted in declaring that an annual total of at least $100,000,000 has been added to the value of our agricultural and horticultural production by this work of plant introduction.

About half of this total comes from one of the first successes alone, namely, durum wheat. This was introduced in 1898 and is now grown in a large area of the Northwest, where it yields an average annual crop of 40,000,000 bushels. To establish this valuable kind of wheat in America on a successful commercial basis required much observation in Russia, its native home, and much experimental work here. Numerous earlier, rather hit-or-miss trials had been made without good results, and nearly $400,000 was finally spent before success was attained. But now durum wheat brings to the wheat farmers of the country each year more than a hundred times the total amount of money originally spent on its introduction and establishment. It is another Alaska!

A second conspicuous success has been Sudan grass, a valuable forage crop for semi-arid regions, introduced from Africa in 1909. By 1918, only nine years after a small bag of seed was brought to this country, 500,000 acres were devoted to its growing. The present annual crop is worth more than $10,000,000. Then we

have the hairy Peruvian alfalfa, which yields from one to two tons more hay per acre than any other alfalfa, and has reached an annual crop value of about $5,000,000.

Still another successful newcomer to our new country from a center of old culture is the long-staple Pima cotton, derived as a variation from the cotton of the Nile-fed fields of Egypt. It now produces an annual crop (chiefly in the Salt River Valley of Arizona) of from thirty to forty thousand 500-pound bales, worth anywhere from $5,000,000 to $20,000,000, depending on the greatly fluctuating value of all cotton. Our Japanese sugar-cane crop is worth $3,000,000 a year to us, and one fourth of our ever-growing soy bean crop comes from introduced varieties yielding more than $6,000,000 annually. Siberian millet brings us $1,000,000 a year.

The avocado, or alligator pear, introduced comparatively recently, is already producing an annual million-dollar crop, and may, because of its steadily growing popularity, find a future place in importance as an American fruit industry alongside that of the orange and grapefruit.

Another new thing, not yet widely known but already interesting many farmers in the South, is the dasheen from the West Indies, a potato-like vegetable which grows well in parts of the South where fall potatoes are a failure. The date palm was practically an unknown plant in this country before 1900, but now there are planted date oases in our arid Southwest, producing an annual crop of the value of a quarter-million dollars.

Not only have these strangers materially increased the total value of our agricultural production, but almost the whole agricultural prosperity of certain regions in the United States depends on them. This is notably true of the date oases in Arizona and California, already referred to, the rice fields of California and Texas, the feterita and kafir fields of the West, and it is even true of the durum wheat areas of the Great Plains region. The solution of the problem of the utilization of our extensive semi-arid regions depends partly on irrigation and partly on the further development of the use of particular kinds of food plants which can thrive without much water. There are such kinds of plants native in various arid regions of the world. Some have already been found, brought over, and established in this country.

ENOUGH? NOT YET

BUT there are certainly more. As Dr. David Fairchild, the famous agricultural explorer in charge of the plant-introduction work of the Department of Agriculture, has well said: "The dearth is not in plant material of great potential possibilities, but in experimenters who can adapt these plants to the wide uses of mankind."

A single foreign country, if thoroughly ransacked, may yield many prizes. Take such a country as China, for example, little known to most of us. The climatic conditions in many parts of China are closely similar to those in various regions of the United States. In addition, the farmers and fruit growers of China have been at work for forty centuries finding the native plants useful for food and modifying them by cultivation to be still more useful. What more reasonable, then, than a thorough agricultural exploration of China for the sake of helping ourselves by taking advantage of the long experience of the Chinese?

Exactly this has, to a certain extent, been done. For almost nine years the agricultural explorer Frank N. Meyer roamed over China and adjacent Turkestan and Russia in search of useful plants, finally losing his life, by drowning, while on his quest. As a result of work done by him and others, we have already greatly profited. The peach industry of Georgia has been built up on the basis of a variety which has a Chinese hybrid origin. The Kieffer, Le Conte, and Garber pears owe their success to their Chinese ancestry. The jujube, and certain Oriental persimmons, yielding most useful fruits for drying, and a variety of chestnut resistant

to the fatal bark disease now rapidly wiping out our native chestnuts, are also part of our Chinese loot.

Similar intensive explorations have been made of central and South America, from the Rio Grande to Patagonia, with rich returns. Tropical and sub-tropical countries seem to have more useful varieties of plants to offer us than colder regions. This may seem strange, at first thought, but a second thought offers some reasonable explanation. Thousands of years ago, twenty or twenty-five, perhaps, great glaciers covered all the northern latitudes and slowly pushed their way as far south as our present mid-temperate regions. They moved slowly but inexorably, and as they came the plant-kinds in their way were either destroyed or had to retreat southward.

When the Glacial Epoch came to an end and the land was free from ice, some of these plants spread to the north again, following the retreating glaciers, but others, adapting themselves gradually to the ever-increasing temperature of the tropics, remained in the south and are there to-day. But many of them are capable of readapting themselves to temperate climates and under careful handling and by judicious hybridizing there can be derived from them many useful additions to our temperate flora.

Dr. Fairchild declares, on a basis of his wide knowledge of the situation, that "there are ten times as many undiscovered useful plants remaining in the tropics to-day as are to be found in the colder regions of the globe, and that the plant breeders are striving by means of their art to select the hardiest of these tropical species and adapt them for cultivation as far north as they will grow." This suggests a special opportunity for amateur gardeners to add to their activities one of really fascinating interest, and of both fundamentally scientific and immediately practical value.

We have so far concerned ourselves with plants as producers of food, and have limited our attention in connection with plant introductions to those of food plants. But, of course, plants furnish us with much besides food. Think of cotton, alone. Or of wood. And the plant explorers and introducers pay attention to the possibilities of adding other useful plants, besides food plants, to our flora. They have even found and brought us many new flowers and other ornamentals. They have introduced giant lilies from the Himalayas; a night-blooming cereus from Colombia, with blood-red flowers as big as saucers; a Japanese sumach which colors brilliantly in the autumn; and a mountain cherry with rose-red blossoms.

Some plants possess not one but many useful attributes. Such a plant is the bamboo, which is to the Japanese and Chinese almost what the cocoanut palm is to the islanders of the South Seas. There are hundreds of species of bamboos, and a number of them have been introduced into the United States. One sees them abundantly in California, where, so far, they are grown chiefly for ornamental purposes.

EXPLORERS ALL

WHAT a fascinating experience must be that of the plant explorer! Not all easy; in fact, often dangerous. Pushing out from the main trails among strange peoples not too hospitable to a foreign visitor; penetrating forest and jungle, mountains and desert; unhesitantly taking chances with untamed man and nature. Meyer in inner China, Popenoe in Africa and tropical America, Rock in Burma and Siam, and others elsewhere, have taken their lives in their hands—poor Meyer lost his in the line of duty—for the sake of bringing new resources and strength and beauty to their country.

If every boy at some time in his life decides to be an explorer, let some of these young gentlemen hungering for excitement think of becoming plant explorers. Exploration that is different: a quest not for the sake of personal glory nor even of glory for the flag, but for the sake of helping America to keep from starving in those future days of overpopulation so gloomily anticipated by the economist-biologists.

World's Work March 1926

Some Things Science Doesn't Know

It Cannot Answer Some Questions Asked by Religion

VERNON KELLOGG

Secretary of the National Research Council

OCCASIONALLY I hear from some of my scientific colleagues, and even more often from various enthusiastic lay friends of science, sweeping and positive utterances regarding the all-knowingness and all-mightiness of modern science. I am even not unaccustomed to hearing myself say something to the same effect.

The great modern conquests of the physical, chemical, and biological sciences are undeniable. This is the age of machines and electrons, of colloids, catalyzers, and chromosomes. The astronomers have penetrated a few inconceivable billions of miles farther into the universe and have scraped acquaintance with the make-up and behavior of suns millions of times larger than our sun. The physicists have penetrated into the inconceivable smallness of the atoms and have discovered them to be veritable little solar systems of whirling electrons around central protons. The chemists have found substances of such extraordinary potencies that in microscopic proportions they have the virtue of stimulating great quantities of other substances to violent reactions.

And, finally, the biologists have made *their* great new contribution to the rapidly expanding scientific knowledge by learning more in the last quarter-century about heredity, that all-powerful determinant of individual and racial fate—if one may take the hereditist's word for it—than had been learned in all time before. And the mechanist-biologists, those merciless iconoclasts who combine in their stern persons the biologist, physicist, and chemist, and submit living matter and its soul to the analyses and measurings and experiments of physics, chemistry, and mechanics, have driven vitalism out of vital processes and made life only a complex phase of non-life!

Truly, science is great and Einstein is its prophet. This is the age of science, of scientific research and discovery, of *homo scientificus*. I am glad to be living in it and proud of the amazing achievements of my scientific colleagues. Only I sometimes wonder if we do not overlook—when we have the opportunity to tell of the rapidly succeeding triumphs of science and to show how very wide and inclusive scientific knowledge is to-day—the fact that some groups of natural phenomena, and especially some very important attributes of life, and particularly of human life, have so far strenuously and successfully resisted the elucidating efforts of scientific men, and hence cannot yet be included in our catalogue of scientifically understood and explained things. It is to this fact that I invite your attention.

As my experience in science is that of a biologist, a professed student of living things, I have not hesitated to cast an inquiring eye on various important attributes and certain significant behavior of human beings. For to the thoroughgoing biologist human life is, nominally, just the life of another living thing, larger than the grasshopper, smaller than the elephant, related to the ape, although admittedly more complex psychologically than any of these. So without attending at all to those phenomena in the fields of physics and chemistry, of astronomy and geology, which science has not explained—and they are very many and very important—I shall limit my scrutiny and reference to certain phenomena in the field of biology, and especially the field of *human* biology, which have so far been a puzzle to the explaining scientist.

THE PLACE OF SCIENCE AND RELIGION IN LIFE

"Science may be truth and so may religion. Science and religion coexist. Both are realities in human life. They should not be looked on as antagonistic or as displacing each other. They should be looked on as complementary. A full human life includes both, depends on both.

"The cause of things may be called God; the manner of things, science. Science has never explained ultimate causes. It explains much of the course of things, whose existence it accepts because it *sees* them exist. It is gratifying that science knows as much as it does. It is unfortunate when its too narrow-minded devotees claim that it knows more than it does."

use for Hartford.

We may begin with the puzzle of organic evolution. For despite all the biologists know about evolution—and that is really a great deal—it is, after all, still much of a puzzle. Certain interesting recent events have recalled, in a seizing way, the matter of evolution to the attention of all of us. For all of us read newspapers, and for the first time, perhaps, since the days of Darwin, evolution has been on the front page of the newspapers.

The events in Tennessee did not come to pass because of any special interest in or enmity toward evolution in general, but because of evolution in particular, namely, the evolution of man. Aye, there's the rub! The mere thought of man's cousinship to the apes leads, with many people, to a temperature. But that is merely an item in the catalogue of all those genealogical branches and twigs arising one from another which make up the tree of organic evolution. There *is* evolution. Biologists know much of its course. There are little puzzles all along the way of this course, but the big puzzle is not a genealogical one. It is the fundamental one of how, of cause, of method. We are less confident to-day that we know the causal explanation of each of the two coördinate major problems of evolution—to wit, the origin of species and the adaptation of these species to their environment—than we were fifty or sixty years ago.

In every decade since those days we have accumulated more proof of evolution, including more proof of the evolution of man, but we have also accumulated knowledge, especially some regarding the nature and behavior of heredity and variations, which tends to show that the old explanations of evolution do *not* explain it. The plausible and fascinating explanation of Lamarck, based on the assumed inheritance by offspring of changes acquired by the parents during the development and lifetime, is found to be insecurely based. Acquired characters, in the Lamarckian sense, are not inherited. Hence, new species and perfected adaptation do not come that way.

Similarly, the more widely accepted and apparently rigorously logical explanation of Darwin, based on the assumption of a life- or death-determining value of the actually occurring many small congenital variations, and of the hereditary transmission of these variations by the parents naturally selected on their basis, in the struggle for existence, is also seen to be more logical than real. Most of the "Darwinian variations" are neither of selective value nor are they inherited by their offspring. They are simply normal fluctuations, according to the law of probabilities, around a mean, fluctuations too small to determine individual fate, and not inherited in the degree of their departure from this mean.

Unfortunately, during this recent period of the undermining of the Lamarckian and Darwinian explanations of evolution we have not developed any convinci[ng] explanation to take the pla[ce]

large part of their food either directly or indirectly from insects.

How then does the account between insects and man stand in this world over which he strives to have dominion? With respect to most insects, decidedly in their favor, for either they are living their own most interesting lives without any appreciable effect on man's or they are doing him friendly service of vital importance. A very few insects are causing an immense amount of damage, this damage being done chiefly by species which he has introduced into countries where the particular sorts of friendly insects that prey upon them do not exist. Furthermore, many of the native insects now doing little harm are potentially just as injurious and will "break out" if anything happens to decrease materially the numbers of the friendly insects that are keeping them in check.

Enjoying an apple that was made possible by an insect pollenating the blossom. From the film "Winning the Insect-life Merit-badge"

Man now has apparent dominion over the earth but his dominion is being seriously contested by six-footed animals, a class of creatures that were here long before there was a man or any other hairy vertebrate and that, unless man learns more about them, may cause his destruction. In this battle for life which he is waging, it is a poor policy to study only the enemies and then only those that are most active. We need to know more about our potential but not yet active enemies and much more about our friends among the insects. This is one of the reasons that the American Museum of Natural History started and is conducting (in, as yet, a very small way) its Station for the Study of Insects where living insects may be closely observed in their natural environment.

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The Color Dust of the Butterfly

By VERNON KELLOGG
Permanent Secretary and Chairman of the Division of Educational Relations, National Research Council

Doctor Kellogg tells us here what it is that makes the "flowers of the air" so beautiful and points out ways in which a butterfly may benefit by the scales that cover its wings. There is some difference of opinion as to these benefits but the statements made by Doctor Kellogg, which are based primarily on his own personal studies, express the view most generally held.
—The Editor.

WE call the moths that flutter about the lamps in the evening "millers" because they are covered with "flour." But the dull-colored Miller Moths are not the only moths that are flour- or dust-covered; all of their near relatives, the Hawk Moths which hover, hummingbird-like, at twilight over the honeysuckles and petunias, the great cecropias and beautiful lunas ("pale empress of the night") and all the butterflies, white and yellow, blue and red and varicolored, are covered with a fine flour which rubs off at slightest touch and sparkles on one's fingers, in the sunlight, like diamond dust. This dust of the butterfly is its gold and silver and gems, its silk and satin gown, for all of the beautiful colors and bizarre and delicate patterns of the butterflies' wings are made by it; the ever-changing, metallic reflections of the great blue-green Brazilian Morphos and of our own little Blues and Coppers which dance about the wet spots of the roadways; the rich red-brown of the Monarch and Viceroy, the black and yellow eye-spots of the Satyrs, the silver patches on the hind wings of the Fritillaries, and the tiger bands of the Swallowtails—all are made by the butterfly dust. But so minute are the particles of the dust that to see what they look like as separate bits we must turn to our microscope for aid.

If we rub a little of the dust from the wings of a common white Cabbage Butterfly on a glass slide, and then look at it through the microscope, what a revealing of delicacy of structure and symmetry of outline! And how varied the forms which this butterfly dust presents! While some of the particles are short and broad, others are slender and long; some have smooth, even margins and some have little teeth or points ranged along one edge. Careful looking, however, will pretty soon show us that, despite the apparent variety and difference of shape and appearance, there are certain important points of resemblance and uniformity among the particles.

First, all are of a character which may best be described as scale-like; they are truly little scales. They are flattened, and usually longer than broad, and have at one end a minute projecting stem or pedicel, while the opposite end is usually the broadest part of the scale. Each scale is thus composed of an expanded blade and a narrower stem. We see, also, that the surface of the blade part is crossed from stem end to opposite margin by many extremely fine parallel lines, or striæ; these lines are really little alternate ridges and grooves running along the surface of the scale. The margin opposite the stem end of the scale is either even or from it project the pointed teeth, short or long, few or many, already spoken of. The side

THE BEAUTIFUL COLORS

of butterflies are due to very minute scales, as is pointed out by Doctor Kellogg in "The Color Dust of the Butterfly" in this issue. Of the two butterflies shown here, the Monarch is red because its scales contain red pigment, but the Morpho is that beautiful blue because its scales bear excessively fine ridges that reflect the rays of light in such a way that they interfere with each other and produce a blue iridescence

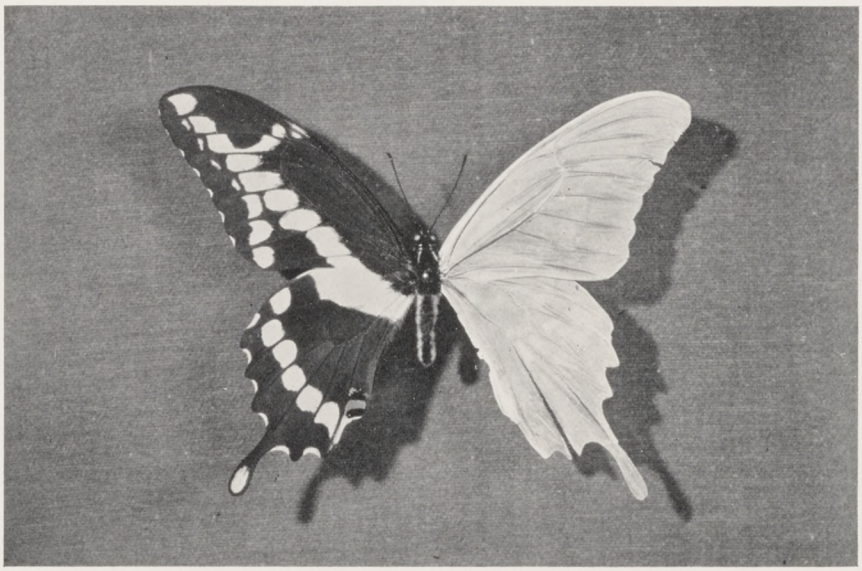
margins of the scale are never toothed but always run in straight or curving lines back to the stem. In length the scales vary from $\frac{1}{350}$ to $\frac{1}{30}$ of an inch, the average length being abuot $\frac{1}{100}$ of an inch. If we cut across one of these scales and examine the cut surface, we discover that each scale is a tiny flattened sac with the narrow space between its lower and its upper wall filled with granules of coloring matter, or sometimes simply with air.

Thus this more careful examination of the butterfly's dust shows that it is composed of a host of minute flattened sacs or scales which are all formed on one general plan, although the first glance through the microscope revealed an apparently confused variety of objects.

The scales on the microscope slide lie in miscellaneous array due to the violence of our handling; on the wings, however, they are bestowed with beautiful regularity of arrangement. If we examine under the microscope a small bit of wing from which all the scales have been rubbed off, we see that the wing surface is crossed by regular rows of little pits or pockets. Into these tiny pits the short stems or pedicels of the scales fit, the scales thus

Scales from a moth's wing, showing gradations between a simple, hairlike structure and a broad, pronged one. Very greatly magnified

being regularly arranged in rows running transversely across the wing, i.e., from front to hind margin, all with their stem ends pointing toward the base of the wing (that part nearest the body). And if we examine now a bit of wing with scales on it, undisturbed, we see that the transverse rows of scales are so near together that the ends of the scales of one row overlap the bases of the scales in the next row in front and, besides that, in each row the scales are set so thickly that they overlap each other laterally. By this doubly overlapping arrangement there is formed a complete sheathing or shingling of the scales over the wing surfaces.



A butterfly which has had the scales removed from its right wing, leaving that wing colorless

The number of scales on a butterfly's wing is enormous. For example, on the wings of one of the large blue Morphos from Brazil there are 165 rows of scales, with 600 scales in each row, on every square inch of wing surface. This makes 99,000 scales to the square inch. As the under surface of the wing is covered by scales as well as the upper surface and as the upper and under surfaces, combined, of the fore and hind wings have an area of about fifteen square inches, the total number of scales on the wings of a Morpho is approximately 1,500,000.

What is the use of the scales? For one of the first questions that the student of natural history asks in his study of any part or organ of an animal's body is, what is the use or function of this part? The answer to this question in the case of the scales is, I believe, this: they have two principal functions, namely, to strengthen and protect the delicate wing membrane, and to produce the varied colors and markings of the wings. In addition, some of the scales have other uses to which I shall refer later.

The wings of insects must sustain the burden of the insect's body in flight, and must be strong enough not to break or fold when they strike the

air the powerful blows necessary for swift sustained flight. The wings of a butterfly are composed of two thin transparent membranes (an upper and a lower) which are stretched over and supported by a few strong ribs or veins. The veins run from the base of the wing to the outer margin, spreading apart and becoming thinner and weaker as they approach the margin of the wing. These veins can be readily seen if one rubs off most of the scales from the upper and lower sides of the wing. Now, in the wings of most insect kinds there are many short cross veins which connect the longitudinal veins and make the wing skeleton stronger. But in the butterfly and moth wings there are but one or two of these cross veins. The strengthening of the wing membranes is accomplished by the firm continuous sheath of overlapping scales. When the wing beats against the air, the resistance of the air tends to bend the wing at right angles to its length. It is evident that the arrangement of the scales, with long axes at right angles to the direction of the strain, and with the broad tips of one row overlying the narrow stem ends of the row in front, is the best possible for this strengthening purpose. Each scale is also made strong by the fine parallel ridges, or striæ, which run across it in a direction at right angles with that of the strain. The covering of scales also protects, in some measure, the delicate wing membranes from injury, especially from raindrops.

The second and undoubtedly a more important function of the scales, however, is that of producing the varied colors and patterns of the wings. This function may, at first thought, seem to be of little real use or advantage to the butterfly. But many naturalists believe that most of the striking colors and markings displayed by insects, as well as by other animals and by flowers, are of direct help and use to the animal or plant in its life. The butterflies are preyed on by many insect-eating birds and lizards, and any means which will help them to elude their pursuers will be of direct

From an enlarged model of a Cabbage Butterfly's wing on exhibition in the American Museum. Note the regular arrangement of the scales

advantage to them. Keen sight and hearing and smell, and swift flight, should be advantageous. And if the butterflies could be colored and marked in such a way as to cause them to be difficult to distinguish from the leaves or flowers or the ground upon which they customarily alight, so that they would often be overlooked by their enemies, that should also be an advantage.

Now it is evident that just this condition of things obtains in many cases. The Graptas, or Hop Merchants, which appear in the fall, with their brown and ragged-edged wings, flutter about like dead leaves driven in the wind; and

many of the Pierids have the under sides of the wings colored yellowish-green, so that when sitting, with wings closed above the back, on some green-leaved yellow-flowered growth like the mustard, they can hardly be distinguished from the plant.

On the other hand, it may be advantageous for the butterfly to be conspicuous and unmistakably recognized. For example, the common large red-brown Monarch is not liked by birds; it has a bad-tasting acrid juice in its body, and flies about without any attempt at concealment, apparently immune from attack. Its vivid color makes it easily recognizable to any bird and, after a few trials of the ill-tasting morsels, birds let the big, red-brown butterflies severely alone. But there is another butterfly, known as the Viceroy, which is not ill-tasting and would be a choice morsel for any bird that might catch it. But it, too, is let alone by the birds. Why? Because it mimics the Monarch! Its colors and patterns are almost exactly the same as those of the Monarch, and the birds mistake it for this ill-tasting species.

But we must return to the butterfly dust on which depend all this color and pattern that may be of so much importance in the life of the butterfly. How are the color and pattern actually produced?

As we have already learned, each tiny scale, usually less than one-hundredth of an inch long, is really a flattened sac, whose two opposite walls do not quite touch. The narrow inner space between the walls in some scales is empty, in others it is more or less nearly filled with fine colored particles, pigment granules. The color of the scales possessing pigment is that of the pigment, because the thin membrane walls of the scale are always transparent. Thus, if all the scales on a butterfly's wing contain brown pigment grains, then the wing itself will be colored solid brown. But very rarely do we find a butterfly's wing entirely of one color. And so we find on a single wing scales similar in shape and size but containing differently colored pigments.

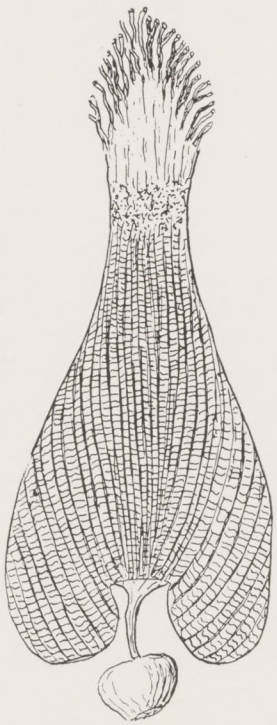
Scales produce color in still another way. Everyone has seen butterflies with wings whose colors are iridescent or metallic, changing in tint as one views them from different angles. The common little Lycænas, the Blues that dance about springs and wells or wet spots in the roads, have colors of this kind. Now, if one rubs some of the scales from a wing which has these iridescent bluish colors and puts them on a glass slide under a microscope, allowing the light to shine through them from the mirror below (examination by transmitted light), one will find, on looking through the microscope, that these scales are not blue at all but either contain brownish pigment or are entirely empty and transparent! If, however, we put something dark under the glass slide, allowing no light to pass through the scales (examination by reflected light), they will again show their metallic changeable blue tint. Indeed, it is not necessary to examine the scales under a microscope. If we hold a *Lycæna* butterfly with wings outspread between the eye and a lighted window or lamp, the wing will no longer appear to be blue but will be a dull yellowish-brown. Hold it down toward the floor or against a dark wall and it will regain its shining blue and greenish tints.

This difference is explained by the character of the structure and arrangement of the scales. Whenever rays of light fall on a series of transparent

superposed plates, as for example a number of thin glass plates placed one on top of the other, the eye perceives various shining colors caused by the interference of the light waves. Illustrations of the production of these colors are numerous and familiar, as in the beautiful colors of the soap bubble, and of oil films, and the prismatic rings which are shown by pieces of mica or by bits of weathered glass. Now, recalling the arrangement of the scales on the wing membrane, the regularly overlapping rows and the lateral overlapping in each row, is it not obvious that we have on the butterfly wing exactly the means necessary to produce physical colors, namely, a series of superposed transparent plates, composed of the delicate transparent walls of the scales? And the colors resulting from this structure and arrangement of the scales are those brilliant metallic blues and greens which vary and change with the changing point of view.

But the scales produce physical colors in yet another way. Remember that each scale bears on its surface many fine parallel ridges, or striæ. Now, brilliant physical colors are produced (by interference) when rays of light are reflected from any surface which has on it very fine ridges or cut-in lines. This, of course, is familiarly illustrated in physical laboratories by the finely ruled Rowland and Rutherford gratings. The ridges on the scales are very fine; on the scales of the Monarch butterfly the ridges are $\frac{1}{12500}$ of an inch apart and on certain scales of the Brazilian *Morpho* the striæ are only $\frac{1}{35000}$ of an inch apart. This striated structure of the scale therefore also produces physical colors.

Two other functions are sometimes subserved by the scales. There can often be found on the upper sides of the wings of male butterflies scales of peculiar shape more or less numerously distributed among the more usual scales of the wing surface. These peculiar scales, when highly magnified by the microscope, give evidence of having many fine openings on the surface or at the tip, and it has been proved that a strong-smelling, usually aromatically fragrant substance exudes from these fine pores. These androconia, as the fragrant scales are called, occur commonly on the male of the familiar white cabbage-butterfly, for example, and if one of its wings be rubbed between the thumb and finger you can smell on your finger-tips this butterfly scale odor. The odorous scales are possessed only by the male butterflies and the scent is supposed to be attractive to the females.



A butterfly's scale that is specialized in such a way that it gives off an odor. Very greatly magnified. Only males have such scales

As to the other of the two special functions, certain butterflies are known

to make faint squeaking noises, and these sounds are produced by the rubbing together of the fore and hind wings. Unusually large and strong scales arranged in a series of rows in particular places on each wing are the structures which produce the sounds.

Finally, we may examine our scales again with another question in mind. Naturalists believe that all the seemingly intricate structures and organs of an animal's body have been developed from more simple structures. If so, what is the simplest, the most generalized, type of the scales?

Among all insects the commonest covering structure of the wings and body is hairs. The simpler and older kinds of insects have hairs on their wings. Can the butterfly scale, with its broad blade and its handle-like stem, its pigment granules, and its effective color-producing structure be derived from insect hairs; be in fact simply a modified or specialized hair? The examination of almost any butterfly's wing will prove this to be the case, for on almost any moth or butterfly wing a series of gradatory forms between simple cylindrical tapering hair and flattened, stemmed scale can be found. The transition from long slender simple hair to broad flat scale most commonly occurs by a slight widening of the tip into two, three, or more branches or fingers lying in one plane, or by the gradual shortening of the basal part of the scale-hair, accompanied by a widening and "filling-in" between the bases of the fingers. This "filling-in" or palmation in the perfect scale may extend almost or quite to the tips of the "fingers," or the fingers may remain as long as the broad blade part of the scale or longer. There is thus produced a flat scale with more or less shortened stem, and with the margin opposite the stem entire or two- to several-pointed, the points being of greater or less length. The fine longitudinal ridges, or striæ, appear with the first widening of the hair. Another common mode of transition is shown in the wings of the cossid moths. Here the scale-hair first widens and flattens at its tip; there is then a gradual shortening and widening for a considerable distance behind the tip so that there is formed an elongate, rather spoon-shaped scale, which continues shortening and widening, the point of greatest width coming nearer and nearer to the tip of the scale. There is thus produced a short broad scale with rounding truncate outer margin, the scale being widest at this margin. The margin is entire, no fingers or teeth appearing anywhere in the course of the development.

Thus the dust of the butterfly is revealed to us as possessing an intricate structure, as disposed in symmetrical arrangement on the wing surface, and as of important use in protecting and strengthening the wings, producing colors and patterns, giving off odors, and making sounds. Finally, the origin and evolution of the scales from simple hairs is readily to be seen.

A similar study, with similar results, may be made of any of the other parts of the butterfly body. The odd shapes, the strange structures, the peculiar habits of insects have meanings, the discovery of which requires careful and persistent study, which is nevertheless always delightful and fascinating. The solving of each particular problem gives us for reward that pure pleasure which is the mainspring of the scientific seeker's endless questing, the happy consciousness of the personal discovery of one of Nature's ways.

James came a fortnight ahead of us, laid the carpets and prepared the bedding, and we had every reason, when placing our heads on our pillows, to thank God for a home.

Soon after my arrival Mr. Stebbens called and sympathized with me in my plans for restoring the Cemetery. I was fortunate in securing a gardener, who was engaged to clear the four years débris and overgrowth for eighty dollars. I have pledged fifty of Louisa Loring's, and Mr. Stebbens promises thirty. Other persons will doubtless help on the good work. I could not help thinking yesterday, as I saw the flowers look up and smile when the superincumbent weight and decay and ruin were removed, that they set us a good example politically. But then, flowers have no memory.

And now a new era in my life has begun. My prayer for usefulness has thus far been granted. Perhaps my heaviest trial may come when that ceases.

One of my favorite poems has it,—

> At sixty-two life is begun,
> At *seventy-two* begin once more;
> Fly swifter as you near the sun,
> And brighter shine at eighty-four;
> For life well spent is ever new,
> And years anointed younger grow.

In life or in death, dear child,

YOUR OWN MOTHER

Atlantic Monthly April 1926

THE FIRST HANGING AT MULINUU

BY VERNON KELLOGG

THE scaffold alone had cost six hundred marks. And that represented so many pounds of copra that all Samoa was mightily impressed. So the island song-makers made new *meles* to be sung in the great village boats as they would be merrily rowed to Mulinuu on the festal day, and the traders enjoyed a brisk run on their rolls of brightest *lava-lava* prints.

The whole affair had grown out of such an insignificant matter — simply the killing of one of the German firm's imported Solomon Island laborers by Fafelé of the Motoola Road village of Tanugamono. In the first place, the somewhat disfigured deceased was so obviously not a white man that it seemed strange that the high chief foreigners should interest themselves at all in the matter. And in the second place, he was equally obviously not a Samoan, with sympathies for the king last deposed, or perhaps for the next to last, so that the affair plainly touched no question of politics.

Inexplicable as it was, however, it was no less certain that the German Consul had demanded of King Malietoa that the murderer be hanged, and the hanging, whatever new and interesting experience that might prove to be, was to be achieved in the kingly village of Mulinuu. Stretching out into the lazy ocean, Mulinuu Point, narrow, low, and almost awash with the gleaming sea-water, but superbly covered with graceful coconut palms, was the abode of the native king and high

chiefs and the seat of the highest native official functions.

There had been a trial before the King. The pleasant-faced murderer, wearing a brilliant new lava-lava, listened interestedly to the interpreter of the German firm who recounted the charge against him. He even waved aside the unnecessary verbiage of the 'talking man' to confess simply: —

'Yes, I killed him. Why not? He was in my taro patch.'

He had followed with some surprise and astonishment the German Consul's positive words, as interpreted with much gesture and emphasis by the official talking man, concerning the enormity of the crime of murder. King Malietoa, dignified and impassive, himself raised his eyes wonderingly at the new vehemence of the high chief Consul.

When the King was ready to pass sentence, he even explained severely to the accused how bad a man he had been, and how very wrong it is to kill people, even black and kinky-haired Solomon Islanders. And then he sentenced the always interested and now large-eyed criminal to three months' imprisonment in jail and a fine of two hundred marks.

The prisoner smiled pleasantly and humbly begged to be pardoned for putting His Majesty to all this trouble, thanked him for his so-improving words, and turned to go. But the Consul, with purple face, and exploding disgust and anger, hurriedly conferred with Malietoa, who quickly made a sign for all to wait. Then he further signed that all should withdraw a little, while he and the Consul had a short but pointed conference.

The Consul wasted few words in making it plain that such a sentence was absurd, and that death by hanging was the only sufficient punishment for the crime of murder. With the plain intimation in his ears that if he did not condemn the murderer to the gallows the German Governor would find cause for interposition in the matter, with the certain result of the hanging of the murderer and in addition the curtailment of the judicial functions of His Majesty, King Malietoa reconvened the court.

Briefly explaining that the high chief foreign Consul had kindly pointed out to him a slight error in judicial procedure, he reconsidered the sentence already passed, and pronounced a new one — to wit, that Fafelé of Tanugamono should, for the crime of murder duly confessed, be hanged by the neck until dead, and may the Lord have mercy on his soul. Fafelé, still pleasantly interested, but a bit larger of eye, again cordially thanked His Majesty for his courteous attention to the humble affairs of a faithful subject, and quietly walked away with the Chief of Police.

Hanging-day at Mulinuu! Under the swaying palms, curved of trunk and shaggy of top, the humming of a multitude; the soft liquids and quick rippling laughter of the brown men and women; the steady low chattering of the little kinky-haired blacks and the serious gutturals and nasals of the small group of Germans, Americans, and English. All Apia and its neighboring villages and plantations — officials, traders, planters, free Samoans, and serf Solomon Islanders — were there. And from Vailele and Vaitele, and the other half-dozen little villages of mushroom houses that huddle under the tossing palms and heavy breadfruits along the shore line of Upolu, had come the long village boats, each with its score of rowers and score more of passengers, all in festal dress and all singing, ever singing, as they slipped easily along in the safe green water of

their aquatic roadway between shore and protecting barrier-reef.

Mulinuu Point was overrun with the spectators of the hanging — or of whatever was to be the spectacle. Those careless laughing faces certainly betrayed no fear or anxiety of the outcome. There would be some speeches by the talking men, the King would receive the homage and the gifts of his scattered villages, and then would be brought forth those five great trade-chests filled with fine mats and *tapas*, with chickens and octopuses, bread-fruit and taro, to be given to the chattering little group of Solomon Islanders in full satisfaction for one black boy murdered. Ah! that was the open secret of all the Samoans present; that was why the hanging was to be celebrated merrily. It was only after much general protest by the people and long days of steady speech by the tireless talking men that the gift-chests had been filled. So much to give for one black boy! But no memory of this remained in the careless minds of the brown men, and it was only as a show and a chance to visit with cousins and friends from the various separated villages that the hanging was now regarded.

But the murmur hushes near the scaffold, where the press is closest, and the hush spreads quickly out to the fringes of the crowd. And as the babble of voices dies away the constant throbbing roar and beat of the ocean on the outer reef rules for the moment; the foaming line of the repulsed breakers catches the eye as one looks out across the shallow green inner water to the limitless blue reaches beyond the reef. A gleaming white tropic bird sails slowly in from the ocean, over the highest palms and on and up, ever with motionless wing, over the very top of Mount Vaea itself. With the bird, one's eyes turn inland. Lifting high above Mulinuu is Stevenson's grave-mountain, its steep slopes lush with tropic bush and forest, on its shoulder the heavy low tomb, made like a Samoan chieftain's, of the man who came to these brown men as one of themselves, so tuned was his heart to their simple, manly ways.

With the steady low roar of the surge mingles another voice. The talking man of Tanugamono, Fafelé's village, is introducing the five trade-chests of gifts from the Samoans to the black men. Leaning on his tall staff, a fresh white lava-lava around his brown loins, and a wreath of fragrant peppers about his naked neck and breast, old Manua is making one of his most florid efforts. With an introduction, in choicest 'mijinery' language, of thankfulness for all the blessings enjoyed by Samoa from the hand of a gracious Providence, he passes by skillful modulation to the specific interest of the occasion. He speaks long and he speaks loud, but even such a glorious opportunity for the exercise of that fascinating thing, speech-making, must have its period. With a brilliant peroration, the great expiatory gift is formally offered. Sensation and satisfaction among the brown men of Upolu!

A small, disreputable, frizzly-haired black arises. In few words and expressive gestures he refuses the gifts and suggests that the hanging proceed.

Sensation and dismay among the brown men of Upolu! Here was an impossible possibility become real. Fafelé glanced dubiously at the swinging rope. A thousand eyes followed his glance. If the hanging were really to go forward, things might be very uncomfortable for Fafelé. A new murmur joined the always present deeper murmur of the tireless waters breaking on the distant reef.

Then the German Consul stepped forward and, addressing Malietoa,

spoke to this meaning: What has so far been done in this matter is well. Justice and its official expression, law, rule in Samoa. Malietoa has made his people understand what heinous manner of crime murder is, and he is now in the very act, so to speak, of dealing out with pitying but unyielding hand the only sufficient punishment for it, death by hanging. All Upolu sees this and recognizes the justice of it, and so do the official representatives of that great nation, Germany, which stands as the benevolent protector of Upolu. Justice is the intention and the will of all. The majesty of the law is unquestioned. It is very good. Let us add mercy to justice. Let the first hanging at Mulinuu be remembered by an act of kingly clemency. As representative of the great Emperor of Germany and her colonies, among which Upolu is a bright particular ocean gem, and on immediate behalf of the German Governor of Upolu, he respectfully suggests that King Malietoa commute the death sentence of Fafelé to the next most severe punishment. Renewed sensation and renewed satisfaction among the listening multitudes at Mulinuu!

The King arises. It is indeed good. *Fa'afe'tai, fa'afe'tai, tele lava* (thank you, thank you in the highest) for the chiefly suggestion. Let Fafelé attend. Let the people hear. The sentence of Fafelé, murderer of a small black Solomon Islander, is commuted from hanging to imprisonment in the jail for three months with payment of two hundred marks fine.

General cheerfulness among the brown men of Upolu, including Fafelé. Consternation on the face of the representative of the Emperor of Germany!

Again, as at the trial, comes a hurried conference between the humble representative of overseas civilization and the sovereign king of a tropic isle. And again, as at the trial, Malietoa thanks the Consul for his just correction, and announces to his expectant and pleasant-faced people, standing in glistening brown ranks about the scaffold, a revision of the sentence. Fafelé shall serve fourteen years at hard labor and pay a fine of four hundred marks.

The pleasant-facedness of the glistening brown ranks remains unmodified. No sudden and violent death for Fafelé — that is the point. 'Hard labor' — well, that is a phrase not in the bright lexicon of Samoan life and cannot be understood at this first coining of it. And whether it is to be hard labor for fourteen years or twice fourteen, it is life — life under the full warm sunlight of tropic days, and under the soft twinkling of the slowly turning Southern Cross by night; life with the ears full of the rustling of great palm fronds, the singing of the coral sands as the lapping waves grind them up and down the beach, and the throbbing giant pulse of the breaking swell on the outer reef.

So the brown men and women of Upolu, in their gaudiest lava-lavas and with their smooth skins all ashine with coconut oil, come away from the hanging at Mulinuu in great good-humor.

And now Fafelé at hard labor! On the beach road from Apia to Mulinuu, that most favored and frequented of Apia promenades, along which all the happy Samoan world drifts, chatting and laughing, are two men in restful, if rather ungraceful, squatting attitude. One has the uniform of office, obviously a member of the native soldiery or constabulary, a conspicuous figure and pridefully self-conscious of it. The other is Fafelé. They say *tofa* (good-bye) to a mutual friend who has been making a long gossipy call, just

as the heavy German doctor, in vast expanse of well-laundered white, comes down the road. The mutual friend strolls on, the royal guard shoulders his gun, and Fafelé taps lightly with a shining new hammer on a bit of coral rock between his knees. The full-rigged doctor, beating slowly to windward, comes up and on, and disappears down the coast. The tapping ceases and the gun comes to a 'lean-against-tree' position. Two long tapering cigarettes, with dry banana-leaf wrapper and crumpled-up home-grown filler, come from their penholder-like rest above the ears, and prisoner and guard resume again their serene contemplation of tropic sky and sea.

Meantime Malietoa is worried. Twenty marks a month from the kingly income — there is no national treasury — goes in salary to the uniformed man, and a varying sum for breadfruit, taro, and coconuts must be paid to keep the prisoner alive. The uniform, too, — envy of all Upolu, not excepting, I fear, royalty itself, — Malietoa well knows is charged on trader Moors's books to him; and how many pounds off from his copra credit that means he can only shudderingly guess. So when Wailua, a responsible and respected citizen of Vai-vai village, owner of many coconut trees and of the largest fish-seine on the island, appeared one day to make a formal proposition to take over the prisoner Fafelé, now serving fourteen years' sentence at hard labor, as his bondman and serf, said Fafelé to haul said Wailua's seine and gather his coconuts, for which service said Wailua will 'find' the prisoner and be responsible for his detention, the King, with gleeful heart, though impassive countenance, gave ready ear.

The negotiations were brief and satisfactory to both sides — aye, indeed to all three sides, for Fafelé, although without voice in the decision, had much voice, albeit indulged discreetly, in the expressions of satisfaction. Life under a shady breadfruit tree on the Apia-Mulinuu beach road, with a shining new hammer with which to tap lightly and intermittently on coral rocks, is all right, if sufficient food comes. But economical Malietoa was making each roasted breadfruit last longer and longer, while as for pig or tinned salmon, no taste or smell! And Wailua, who was own brother-in-law to Fafelé, — it is odd how little knowledge of native family relationships the German authorities have, — was known to cover his banana-leaf tablecloths with an unusual luxury of food.

So finally Fafelé, murderer, hero of the first hanging at Mulinuu, cynosure of the chatting, laughing promenaders of Apia beach, and only prisoner at hard labor in all Samoa, disappears from our view. For Vai-vai village is not on the beach, and what manner of life Fafelé may lead in the household of his brother-in-law, Wailua, is well screened by the great grove of coconuts, bananas, and breadfruits in which this quiet little hamlet nestles. But I have heard that he hopes earnestly to be granted life to serve his sentence out. For Wailua loves his wife, and is a merciful jailor to his wife's brother.

ART AND THE X-RAY

BY ALAN BURROUGHS

I

THE audience reached by a short story, 'La Dame qui a perdu son peintre,' written in 1907 by Paul Bourget, cannot be extensive; the satire of the tale and the edge to its Gallic politeness have been appreciated chiefly by readers who are familiar with the writings and methods of art experts. For myself, engaged in the study of paintings, the story has an inescapable point, telling as it does the history of a forgery and its acceptance by all concerned, even by the poor student who painted it — and especially by the 'famous critic' who has a 'scientific method' at his finger-tips.

The so-called 'scientific method,' delicately lampooned in Bourget's story, is a by-product of the 'emotional method,' which simmers down to sublimated guesswork. A single date or incident grows oversize and bears a startling crop of supposed 'facts'; slight resemblances lead to shockingly definite comparisons. Among recent examples is the well-reviewed volume on Rembrandt which states as a fact that only fifty or so of the large number of paintings attributed to the master are genuine. Trivial resemblances furnished the critic in this instance with a devastating method. The fact that the nose and high cheek-bones of 'The Old Lady Paring Her Nails' (owned by the Metropolitan Museum of Art) seem to resemble those features in the old ladies painted by Nicolas Maes was deemed sufficient reason for announcing Maes as the author of the famous picture in the Metropolitan Museum of Art, which contains many of the moving characteristics — the weight and bulk of form, conviction of design and gesture, simplicity and disposition of light — that are clear in Rembrandt's mature work. Other Dutch painters of the time might possibly have achieved something similar in breadth, but not Maes, who has signed himself as the tight little painter of sentimental genre.

This volume has been discussed half a dozen times by reviewers who regret the author's shortsightedness; my point is merely to remind the reader of a clear-cut reductio ad absurdum in recent criticism. More insight, more inspiration, perhaps — but that incident is in the past; and inspiration alone would be no guaranty of rightness.

Information is the essential, and the means of obtaining facts are the fundamental elements in serviceable criticism.

The student of style can be misled by restorations on a picture, his scholarly inferences being rendered useless by lack of information in regard to the physical conditions wherein an expert picture-restorer revels. He needs other means, an extra aid to study, which will simplify his material and sort out the important details. His critical labors deserve some method which will remove the hazard involved in trusting chiefly to matters of taste

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HUNTING BIGHORN WITH A CAMERA

By DR. VERNON KELLOGG

NATIONAL RESEARCH COUNCIL

THE Rocky Mountain sheep, or bighorn, is one of the most extraordinary and interesting of American animals. It is not limited to the Rocky Mountains, but varieties of it are found also in the Sierra Nevada and in the mountains of Alaska and Mexico. In earlier years it was a great favorite of big-game hunters but is now protected by game laws.

As a boy interested in natural history I had read all that I could find written about the bighorn. Especially had I soaked up all the stories about its wonderful surefootedness, its marvelous speed over rough rocks, and, most thrilling of all, its alleged habit, when closely pressed, of leaping headfirst over high sheer precipices and landing on its great strong curved horns. Of course, only the males, and the old males at that, have the big horns, so that the ewes and young would not be able to follow the head of the family in this wild leap for liberty. Rather selfish of father, it would seem, to desert the family this way. But he had this good excuse. The hunter was really after father and that pair of big horns for a trophy, and was likely to let mother and the kids alone—unless, unfortunately, he was hunting for meat and not glory.

When I got to college and began to study natural history seriously I still remembered the stories about the bighorn, and kept an eye out for a chance to get to Colorado and into the Rockies to see these interesting animals in their rocky fastnesses far up among the great peaks. Also, as I lived in Kansas, which, whatever else it has in the way of scenery—and that isn't much—has no mountains at all, I wanted to see mountains, high mountains and deep canyons, with great silent forests of spruce and pine and swift clear mountain streams with trout in them. I wanted to camp and climb and see bear and elk and deer —and bighorn.

So five or six of us college mates figured out very carefully what it would cost to spend a summer in the Colorado Rockies. We had to figure carefully, for we were all poor, and our families thought they were doing enough to support us in college without grub-staking us for an expedition after bear and bighorn in Colorado. We decided that we could live chiefly on flapjacks, trout, bear-meat and wild red raspberries, of which menu only the flapjacks would cost us anything. The rest of the food we would find in the mountains. We would do our traveling on foot, after once getting to Colorado, with perhaps a burro or two to help carry our packs. In addition to our guns and trout rods we would take cameras, and I, at least, registered a solemn vow that I should hunt bighorn, if not with a gun, which was prohibited by law, at any rate with a camera. And I may say right now, based on considerable experience, that hunting wild animals with a camera is no less exciting than hunting them with a rifle, and requires not less, but more, skill and persistence.

Our little group of Kansas college freshmen was composed of chaps who had some stuff in them. There was Fred Funston, who later fought in the Philippines, captured Aguinaldo and became a major-general in the U. S. Army; Her-

bert Hadley, who became governor of Missouri, and only narrowly missed being nominated for president by the Progressive Republican party in the days of Roosevelt; William Allen White, now a well-known editor, author and publicist; and two brothers, named Franklin, one of whom has become an eminent chemist and the other as eminent a mathematician and physicist. But at the time of our trip after bighorn we were all as green as Kansas corn in a good summer, and perfect tenderfeet as far as camping, climbing mountains and hunting big game were concerned.

But I must get along to the bighorn. We made headquarters camp in a beautiful little, high-level, glacial valley in the Front Range of the Colorado Rockies, and started our climbing by getting to the top of Long's Peak, 14,255 feet in altitude, and one of the highest, most difficult and dangerous of the Colorado peaks. After that we did all the other peaks in the vicinity. It was great sport —and always with the tang in it of a little danger. Funston and I once got caught in a violent snowstorm on top of an especially rough peak. The snow changed to sleet while we were out in the middle of a great snowfield which lay at a steep angle on the mountain flank and simply had to be crossed in order to get down to timberline from the summit. The surface of the field became like ice, and we could only move over it by breaking through the crust for each footstep. It was very dangerous going, for once started on a slide we couldn't possibly have stopped until we got to the bottom of the field, which was at least a thousand feet below, and margined by a rampart of rock against which we would have dashed at terrific speed. But we made a special point of not slipping—and didn't!

After we had cleaned up all the nearby mountains, in the course of which we saw many signs of bighorn—especially their many narrow little trails cut three or four inches deep along the mountain flanks well above timberline, but none of the animals themselves—we learned from an old hunter and trapper, who lived alone in a rough cabin not far from our camp, that while the wild sheep used to be plentiful in the near-by mountains and still were to be found there occasionally, more of them could be found in the high mountain country farther north toward the Wyoming line. So we packed up Billy the Burro to the limit of his capacity to carry things, put the rest of the camping outfit on our own backs and started north. We picked up trails when we could find any, but mostly we just headed north. For much of our way we worked along the flank of the range above timberline, to which we had to come down at night to make our campfire for cooking and keeping warm. We had been told of a long extinct volcanic crater called Specimen Mountain to which the bighorn were reputed to come from long distances away in order to lick on the green and yellow beds in the crater bottom. This was our goal.

On our way we started up a rather small bear and chased it into a hole in a great rock pile. How to get it out? After sitting around the hole for a while, without working out a satisfactory way, Funston finally suggested this interesting plan. He volunteered to crawl into the hole and stir up the bear, which would presumably get angry and chase him out. The rest of us were to stand by the side of the hole and shoot at the *second* object to come out; the first one Funston fondly expected would be himself. This plan seemed reasonable, but on careful consideration we vetoed it; there seemed to be just a chance that nothing at all might come out of the hole, not even the future capturer of Aguinaldo himself.

Finally we arrived near Specimen Mountain and established camp in a beautiful high level pass only a little below timberline. This pass was really part of the Continental Divide, for the water which flowed down from one side of it was carried into the North Platte, thence into the Missouri, the Mississippi and finally into the Gulf of Mexico, while the water from the other side, only a hundred yards away, flowed into the Grand River and thence by the Colorado River into the Gulf of Lower California. There was plenty of water and firewood, and by scrambling down a thousand feet to the Grand we could get all the trout we could eat. It was a fine camp. We were now ready for bighorn.

Excitement soon came, although at first not from bighorn. One of the boys had left camp with a shotgun soon after we had got things in order, a cooking place fixed up with stones, level places found on which to spread out our bed blankets, and our flapjack flour, sugar and salt under cover of a rubber poncho. The hunter had gone forth to try to find a blue grouse or two for supper. His shotgun shells were loaded with large birdshot. Just at dusk he came back madly running and calling for help.

It seemed that in his wandering he had discovered a little bear cub, and, like the proper tenderfoot that he was, had sent a load of birdshot at it. The cub was not much hurt, but enough to stimulate it to a loud squealing which had brought an angry mother bear to the rescue. There was nothing for the brave hunter to do but to start for camp with all possible speed, which he did, without hesitation and with no glances backward. One sight of mother bear had been enough. It was, according to the hunter, probably the largest grizzly bear that had ever existed in the Colorado Rockies! Fortunately for our indiscreet hunter—and for us—mother bear did not follow him to camp, but turned back to her cub.

And now came the bighorn. Literally that. For as we busied ourselves with cooking supper, and further fixing up of camp, we were startled by a sudden noise and looking up were more startled to see half a dozen bighorn charging down the mountain slope just behind us and directly toward us. They dashed right through our camp, swerving only a few yards to one side as they saw us and our little fire. It was breath-taking.

We found next morning that we had chosen for camp site a spot over which a number of bighorn trails ran from Specimen Mountain on the north down the slope across the little meadow on the pass and up the next mountain of the range to the south. So rarely visited was this region that the bighorn, with all their wariness, were not sufficiently startled by our presence to leave their regular trail by more than a few yards. However, no more such surprising visits occurred.

Next morning we set out and up on a reconnaissance and found that above timberline, which was only a few hundred feet higher than our camp, the steep slope of the old volcano was smooth and easy to climb. It led us directly up to the rim which ran evenly and almost completely around the great crater. Thus we could easily walk all around the crater, keeping just low enough below the rim on the outside to prevent any animals within the crater from seeing us. But it was easy for us to see the inside of the whole crater by merely crawling carefully up to the rim, and lifting our heads slowly up high enough for us to peer over the crater's edge.

The inside of the crater presented a remarkable sight. The bottom and walls were composed of old ashes and scoriae with some cliffs of shining basalt and numerous upstanding castles and pin-

nacles of braccia or volcanic conglomerate. Some of these stood up fifty or sixty feet from the floor or side walls of the crater and were twenty or thirty feet wide.

As we cautiously looked over the rim we were gratified to see a group of bighorn resting quietly on a sort of basalt platform jutting out from the crater wall. Two or three were lying down, two or three more were moving slowly about, while on a higher part of the platform was a fine old male with tremendous curved horns, standing rigid and alert, evidently the lookout for the band. We watched them admiringly for a few moments, when unluckily one of us, in trying to change position, pushed over the rim a loose stone which bounded down the inside of the crater.

Like a flash every sheep was on its feet and on the *qui vive*. Because we kept perfectly motionless, the big lookout could not be sure, for a moment, where we were, but taking his cue from the direction of the bounding stone he started up the precipitous side of the crater away from us, followed closely by all the others. It was a beautiful sight; their ease and confidence in swiftly getting over the rough steep going was impressive. In a few moments they were out of the crater, and, heading north along the mountain's upper flanks, they soon disappeared from our view. But we had seen bighorn close at hand, although too far for photographing, and felt that their fright had not been great. They would come back.

After they had gone, and we could stand up and move around the rim and survey the whole of the crater, I worked out a plan which I felt sure would result, if everything went according to plan, in getting some bighorn close-ups.

The plan was very simple and was suggested by the two facts, first, that one could move all around the rim, out of sight, and then come into sight wherever desirable, and second, that the great breccia castles ought to give one sufficient protection from being seen to allow one to work down into the crater, keeping one of these castles between one and any band of sheep that might be anywhere in the crater. Of course the wind would also have to be right—that is, blowing from the bighorn toward the stalker and not from the stalker toward the bighorn. They have a perfect sense of smell.

So the next day we all went up together again and, on peering over the rim, were wildly excited to see a band of nearly thirty bighorn in the very bottom of the crater. Almost between them and us towered a great breccia castle. The wind was just right to allow me to try to get down the crater wall behind the castle.

I began a hard and wearisome descent of nearly two hours, slowly crawling over sharp bits of basalt, rough blocks of conglomerate and beds of old ashes, keeping always that protecting breccia castle between the animals and me.

I finally got down to the base of the castle. This was as far as I could go. I was within a hundred yards of the band of bighorn, which had all fortunately kept close together. Behind the castle I waved a handkerchief to my carefully watching companions on the rim above, who immediately set off below the rim on the outside to a point just opposite where I had gone down. They were to scatter a little there, and then all to show themselves at once on the rim to frighten the sheep towards me.

It worked. I was ready with camera already pointed to that side of the castle which seemed the most likely to be chosen by the sheep in their flight.

I heard a clattering of hoofs and rocks. The noise grew louder. My companions added violent yells to be sure that I

knew the sheep were coming. I did know it. I couldn't help knowing it. I was growing violently excited. I held the camera at a ready angle. And then that magnificent band, led by two superbly-horned old males, dashed around the side of the castle, bearing directly toward me. I thought they would run over me. But they didn't. They swerved slightly and there they were, all lined up, broadside on, only twenty yards away. It was a picture made to order.

But, alas, it was too exciting. I had a bad case of buck fever. My hands jumped as the sheep did. I couldn't hold the camera still. It was no use. But I did manage to press the bulb.

That negative when developed and printed from yielded a picture of bighorn at close range. But every sheep in it is a blurred something with a dozen legs. No naturalist would recognize the animals on it. He would think they were centipedes. But I recognize them. It is my prize picture.

classification and in the problems of distribution, speciation and phylogeny is evident, for it is clear that the chromosome complex is the vital mechanism of evolution, and there are welcome signs at this meeting that the physiologists and biochemists are coming to our aid in solving the pressing problem of the modes of action of the chromosomes in development.

C. C. HURST

TRINITY COLLEGE,
CAMBRIDGE, ENGLAND

INTERNATIONAL CRITICAL TABLES

ONE of the major projects of the National Research Council has been the preparation and publication of International Critical Tables of Numerical Data in Physics, Chemistry and Technology, undertaken at the request of the International Union of Pure and Applied Chemistry and the International Research Council. The work of critical compilation began in 1922, and the first of the projected five large volumes was published last year. The responsibility for the editorial work has rested on Dr. E. W. Washburn, editor-in-chief; Dr. Clarence J. West, associate editor for chemistry; Dr. N. Ernest Dorsey, associate editor for physics; and Dr. F. R. Bichowsky and Dr. Alfons Klemenc, assistant editors. These responsible editors were assisted by an advisory editorial board composed of seven eminent chemists and physicists, and by ten corresponding editors and about 300 cooperating experts. The data used are derived from material in eighteen languages.

Nearly $200,000 has been expended on the compilation. This money has come as gifts from 244 firms and individuals and two major foundations (Carnegie Corporation and International Education Board). The gifts from these foundations, amounting to $70,000, were made for the special purpose of enabling the published tables to be sold at a price not prohibitive to individual buyers. Publication was undertaken by the McGraw-Hill Book Company, Inc., the well-known publishers of scientific books, under a special arrangement regarding selling price.

The regular price for a set of five volumes was fixed at $60, but a prepublication price of $35 a set was made to all subscribers ordering sets before the actual publication of Volume I.

The more optimistic among us estimated that we should have prepublication subscribers to the number of 1,000 to 1,500. The actual result is that 6,638 sets have been ordered at the pre-publication price of $35, and several hundred sets at the post-publication price of $60 a set. The distribution of these orders presents some interesting features.

Of the total of 6,638 sets ordered in advance of publication, 4,694 sets were ordered by individuals, 531 by libraries, 450 by educational institutions and 973 by industrial concerns.

As regards the geographical distribution of the orders a gratifying wideness in this distribution is apparent on going over the lists. The United States has ordered 4,867 sets, and foreign countries 1,771 sets. Fifty-three countries and colonies are represented in the foreign list with Great Britain and Ireland leading with 379 sets ordered, Germany next with 224 and Japan third with 146. France has ordered but 58 sets which are not as many as those ordered from Holland (91), Sweden (72) and Italy (67). Little Belgium has ordered 50 sets. Darkest Russia has ordered 27 sets, and benighted China 43 sets.

The total list of foreign countries, together with the figures of sets ordered follows: Africa, 20; Argentina, 19; Australia, 20; Austria, 37; Belgium, 50; Brazil, 5; Canada, 151; Ceylon, 1; Chile, 9; China, 43; Colombia, 2; Cuba, 10; Czechoslovakia, 37; Denmark, 31; Dutch East Indies, 17; Egypt, 1; Estonia, 4; Finland, 11; France, 58; Germany, 224; Guatemala, 1; Great Britain and Ireland, 379; Haiti, 1; Hawaii, 9; Holland, 91; Hungary, 9; Iceland, 1; India, 29; Italy, 67; Japan, 146; Jugoslavia, 4; Latvia, 3; Luxembourg, 1; Mexico, 17; New Zealand, 2; Norway, 38; Palestine, 2; Peru, 7; Philippines, 10; Poland, 12; Porto Rico, 7; Portugal, 1; Rumania, 8; Samoa, 1; Siam, 2; Soviet Russia, 27; Spain, 18; Straits Settlements, 3; Sweden, 72; Switzerland, 49; Syria, 2; Tasmania, 1; Trinidad, 1.

VERNON KELLOGG

NATIONAL RESEARCH COUNCIL,
WASHINGTON, D. C.

SCIENTIFIC EVENTS

EXCURSION OF THE INTERNATIONAL SOIL SCIENCE CONGRESS

THE national committee, which is planning for the work of the International Soil Science Congress, which is to meet in Washington on June 13, is arranging for an excursion through the United States to follow immediately after the close of the meeting on June 22.

The itinerary is now being worked out. It is planned to have the excursion go south from Washington to central North Carolina, thence across the mountains into Tennessee, southeast to Georgia, thence to Alabama and through Tennessee to southeastern Missouri, across that state to Kansas, thence either through Colorado, Utah and Nevada to California, or through Arizona and New Mexico to California, then north through Oregon and Washington to British Columbia,

east through Alberta and Saskatchewan to Manitoba, thence south through Minnesota, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania and back to Washington. The party will travel by special train.

Stops will be made at all the experiment stations and agricultural colleges that can be reached on this trip and also a large number of additional stops are being planned to examine and study the soils in the various sections of the country. General agricultural conditions, type of crops, methods of tillage and similar features will also be taken up.

The tentative schedule for California calls for a stop in the Mojave Desert on the way in, then a day at Riverside, a day at Fresno and a day at Berkeley. The plans for these stops are not yet worked out, but provisionally, at Riverside a half day will be spent driving over that general portion of the state, visiting six selected excavations where the soil conditions can be studied and also visiting and studying citrus groves and irrigation and fertilization experiments. The afternoon will be spent at the Citrus Experiment Station studying the work that is there being carried on. At Fresno it is planned to spend a half day driving about the general region, visiting three or more representative excavations where the soil and subsoil conditions can be observed. Considerable time will be spent on the drainage and alkali reclamation tract at Kearney Park and in addition a visit will be made to the Association Packing Plant at Fresno. At Berkeley the entire time will be spent in the laboratories and greenhouses of the agricultural department.

THE SCIENTIFIC DIVISION COMMITTEE OF THE UNITED STATES FISHERIES ASSOCIATION

ON November 15, 1926, President Dana F. Ward appointed Lewis Radcliffe as chairman of the scientific division committee, a new division of the U. S. Fisheries Association, with instructions to select the committee and organize the group. Mr. Ward suggested that the "scientific division" would serve as an advisory committee in helping to establish the association's policy with respect to scientific investigations, to keep its members advised of advances in science and to aid in the building up of research organizations through federal, state and private agencies.

The following tentative program of operation has been evolved:

1. The branches of science selected for inclusion in the division's organization are—bacteriology, dietetics, economics, statistics and technology.

(a) Bacteriology plays a very important part in questions pertaining to the spoilage of food. Examples—reddening of cod; decomposition of canned foods; taking and marketing of oysters.

(b) Biological investigations must furnish the fundamental facts as a basis for sane legislation and to insure the highest development of our fishery resources without depletion or exhaustion.

(c) Dietetics—the fishing industry should capitalize on the revolutions of science as to man's food requirements. Aquatic products are unusually rich in elements shown to be necessary to man's well being.

(d) Economics—the accumulation of fundamental data on marketing of fish at home and abroad is basically essential to the growth, stabilization and permanence of our fisheries industries.

(e) Statistics—complete, continuous and comparable statistics of the catch are an essential to the proper husbanding of this resource; trade statistics in the fisheries industries as in others are necessary to level out the peaks and valleys of production and to serve as a stabilizing factor.

(f) Technology—through technological investigations and their application America has forged to the front in developing improvements in the methods of catching, handling and merchandising fishery products. Continued investigations on a larger scale are essential to maintenance of that position.

2. Division activities.

(a) To aid the association in developing a policy on scientific matters along broad fundamental lines.

(b) To coordinate the effort of federal, state, municipal and private scientific fisheries research agencies; promote harmony; and when requested, to advise such agencies as to lines of research which promise to be of greatest benefit to the fullest development of our fisheries for the common good of our people.

(c) To keep those engaged in American fisheries informed as to the advances made in the several sciences affecting fisheries. This would include reviews of scientific articles not easily accessible and their interpretation.

The scientific division committee consists of thirty-four members, divided into six sections. Dr. P. B. Parsons, New York Conservation Commission, Albany, is chairman of the bacteriology section; Elmer Higgins, U. S. Bureau of Fisheries, of the biological section; Dr. D. K. Tressler, Mellon Institute, of the dietetics section; L. T. Hopkinson, U. S. Tariff Commission, Washington, of the economics section; J. H. Mathews, New York City, of the statistical section, and H. F. Taylor, Atlantic Coast Fisheries Co., New York City, of the technological section.

FELLOWS OF THE ROYAL SOCIETY OF EDINBURGH

AMONG the candidates recommended by the council for election as fellows of the Royal Society of Edin-

George Sterling

By Vernon Kellogg

I KNEW George Sterling best and most memorably at Carmel. He revealed there by the shore, in the pine woods, and at his own hearth, an attractiveness not to be described, let alone explained, in words. He was the center of our Carmel atom—the proton of positive electricity around which the rest of us revolved as negative electrons, held from flying off tangentially by his magic attraction.

At his house we came together for New Year's eve and other times, winding up into the "Forest Eighty" with candle lanterns in those days of primitive Carmel, bringing sometimes something to eat or drink to add to his own and Carrie's generous providing. We chatted, we sang, we danced. But always we were guided by his mood. His presence pervaded the house; it penetrated us. Some of us—I was not one of them—would occasionally bring a bit of verse hopefully to show him. He was always kind—but truthful, in a way that was not a hurt but a help. Nobody questioned his judgment. What he said was oracle.

What my own relation to Sterling was is hard for me to define. Probably I never really knew. I was a university professor; that meant the dry academic type. Sterling was not interested in drouth. But I was a scientist. Sterling was interested in science. We talked Darwinism, bitter natural selection, nature red in tooth and claw, the animal in man. He wrote once, and dedicated to me, much to my pride, a short poem giving in fewest words a seizing picture of this struggle. He was evidently deeply impressed by it.

He spoke sometimes of the hopelessness of life. But he was certainly often happy. I remember him happily collecting abalones; happily amusing us all at rehearsals in the Forest Theater as a half-clad Indian; happily acting the unconventional host on New Year's eve. Yet sadness was never far away. The look of it would steal over his face any time, anywhere.

I cherish the memory of him; and yet I never really knew him.

THE PROGRESS OF SCIENCE

VERNON LYMAN KELLOGG

VERNON LYMAN KELLOGG—scientist, author, teacher, citizen of the world, student of life, promoter of scientific organizations. These are a few of the designations which may be applied to the man who has recently left us (Hartford, Connecticut, August 8, 1937) after a long and useful life which began in the home town of his famous friend, Will White (Emporia, Kansas, December 1, 1867). Between these dates the small-town Kansas boy saw much of the world, served with great leaders in many fields of human activity, contributed usefully to the advancement of biological knowledge, but, above all, stood out as an interpreter of life and its evolutionary development. He received an early impulse toward biological study through association with his teacher and friend, Francis H. Snow, who occupied the "settee" of science and mathematics in the early days of the University of Kansas. When Snow became chancellor of the university, Kellogg served as his assistant and private secretary until he went to California in 1894. At Leland Stanford he became likewise intimately associated with its president, an even more famous biologist, David Starr Jordan, and with him for almost two decades collaborated in the production of numerous texts upon elementary biology and upon the philosophy of biology. During the World War he was on leave and closely associated with another noted friend, Herbert Hoover, in the alleviation of suffering in Belgium and Poland. Upon his return to this country he joined in the movement to establish the National Research Council as the executive body of the National Academy of Sciences for bringing scientific aid to the government in its war activities. Under the peace-time continuation of the National Research Council he was made its permanent secretary, in which office he continued until his tragic illness obliged him to relinquish it in 1932. In this association he was led into many related phases of scientific and philanthropic organization. There he held administrative positions in Science Service, the Council of the American Association for the Advancement of Science, the Rockefeller Foundation, the Brookings Institution and many others. In most of his activities he was associated with powerful leaders whom he served as a faithful and efficient friend.

In his work as an interpreter, however, he went alone, and it is here that he was most at home. Even as a student he felt the urge to share his thoughts and impressions of nature with others. In the local paper he ran a column entitled "Bird Notes," in which the captivating style which characterized his writings early made itself manifest. The broad implications of biology always appealed to him and he wrote extensively upon evolution and Darwinism. In his own studies, concerned mainly with insects, he came to see the value of the practical applications of biology to human welfare and not only wrote upon this subject at some length, but proceeded to an evaluation of Luther Burbank's work. It was not surprising with this background that he turned easily to the practical use of science in the amelioration of human suffering during the war. Equally naturally he extended his thought to the problems of human behavior, so many phases of which appeared in exaggerated form under the stress of conflict, and not only was he a good interpreter of the way people think and act, but he was both able and interesting in his presentation

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of observations and conclusions. Kellogg's activities, though varied, sprang largely from his early manifested interest in teaching. At first this followed the conventional personal instruction of student by teacher, but very soon it extended itself into the writing of textbooks for similar types of instruction, passing then into the production of works dealing with theoretical biological questions. Always, however, with the mind of the interpreter, he sought to bring to the general reader some knowledge of the way in which the problems of life and living appear to men who give them serious thought against a comparative biological background. In many other ways he showed his interest in educational matters, utilizing often toward this end the connections established in the National Research Council. Conspicuous in this direction was his chairmanship of the Division of Educational Relations, wherein he had many opportunities for the study and promotion of educational projects. As the years passed there was less and less of writing and teaching and more and more of administration, until it became all-absorbing and excessive—and then the final incapacitating illness brought a lingering end to all physical efforts, although a sustained interest in old pursuits and friends continued to the last. Many responsibilities came to Kellogg and all these he met with ease and ability. Honors came also in corresponding measure, and they were carried modestly and without ostentation.

C. E. McC.

THE ROCHESTER MEETING OF THE AMERICAN CHEMICAL SOCIETY

With 3,483 chemists registered, the ninety-fourth meeting of the American Chemical Society in Rochester, N. Y., from September 6 to 10, was the second largest in the history of the society, approaching the record figure of the Chemical Industry Tercentenary meeting in New York in the spring of 1935.

At seventeen divisions and the microchemical section, 472 scientific papers were read. The general session on Wednesday, September 8, which was Central Day, was addressed by Dr. Nevil Vincent Sidgwick, of Lincoln College, Oxford, one of the leaders of the modern school of organic chemistry in Great Britain. Dr. Sidgwick spoke on "The Uniqueness of Carbon." Dr. C. E. K. Mees, director of research of the Eastman Kodak Company, illustrated "Recent Developments in Color Photography."

Dr. Edward R. Weidlein, director of the Mellon Institute of Industrial Research, gave the annual presidential address on Tuesday evening at the Eastman Theater, depicting "A World of Change." America, Dr. Weidlein declared, has achieved the chemical leadership of the world.

"It grows more and more apparent that to help one's country to be chemically independent is the profoundest kind of patriotism," Dr. Weidlein concluded. "The objective of scientific research to-day, moreover, is broader than the solution of technological and chemical problems. It takes into its view the responsibility for enlivening the imagination of the masses who will be the chief beneficiaries of these new ways of living. A true scientist . . . expects to live in a changing world."

Rochester's three largest hotels, the Seneca, Sagamore and Powers, were overrun during the meeting. While the Seneca was the headquarters hotel, divisional meetings were also held at the Eastman School of Music, the Sagamore, the Rochester Club, the Powers, the Rochester Gas and Electric Corporation Building and the Columbus Building.

The society's council, convening on Wednesday morning, gave a rising vote of thanks to the members of the Rochester

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Charles W. Yost

Social Limits To Growth

WASHINGTON — President Carter and Prime Minister Callaghan are talking this week about a wide variety of issues, but probably most of all about the accumulation of economic problems now besetting the world.

Yost

That the populations of less-developed countries should still for the most part be condemned to the bare living standards which have been the immemorial lot of most of human kind is not surprising. But that the affluent countries of Western Europe, North America and Japan should, despite their phenomenal economic progress during the past century, still be afflicted with recurrent economic instability, persistent unemployment and growing social tension is puzzling and disturbing.

These problems will no doubt be examined during the Western summit meeting taking place in London this spring, and measures to cope with them in the short term will be adopted. But are there deeper causes which will resist short-term solutions, even those applied by the richest nations acting together?

In a brilliant recent book "Social Limits to Growth," a British economist, Fred Hirsch, former financial editor of The Economist and adviser to the International Monetary Fund, argues that there are.

The rosy dream of the western world for the past century and a half has been that, with the growth of mass production, the beneficent "invisible hand" of the free enterprise system and the prolific miracles of technology, the affluence enjoyed by a small minority could gradually but steadily be extended to all, or at least to the vast majority. Particularly during the last three decades, that "leveling up" has seemed to be happening in most western societies.

A few years ago there was a flurry of alarm about physical "limits to growth," the undeniable fact that many resources are finite and cannot support indefinite human population growth. We have been reminded by the energy crisis and the recurrent threat of famine that this alarm is not a delusion. Nevertheless, the predominant reaction has been that new technological discoveries will enable us to push back these physical limits.

Hirsch warns us of more immediate barriers to the achievement of the liberal dream, his "social limits to growth."

"Beyond some point that has long been surpassed in crowded industrial societies," he writes, "conditions of use tend to deteriorate as use becomes more widespread ... Where the social environment has a restricted capacity for extending use without quality deterioration, it imposes social limits to consumption."

For example, he points out, as more and more people acquire automobiles their use becomes more and more inconvenient. The Long Island Expressway earns the nickname of "the world's longest parking lot." As more people build cottages and bring motor boats to a mountain lake, it loses the wilderness atmosphere they all sought.

As more and more young people can acquire a university education, the economic value of university degrees declines and the supply of graduates outruns the supply of professional jobs for which they prepared themselves. In Italy, for example, where in 15 years university graduates have increased from 23,000 to 70,000 per year, the quality of everyone's education has declined and the ranks of white-collar unemployed substantially increased.

Silk stockings and orange juice can be made available to everyone without injury to anyone; but many benefits, like cars, university degrees and houses in the country, become less and less beneficial as they become more and more numerous.

Hirsch discerns a moral as well as a structural flaw in the evolution of the liberal dream in modern times. He points out that Adam Smith's beneficent "invisible hand," which in 1776 was believed to insure that the pursuit of individual self-interest would automatically best serve the general interest, presumed a well-established private morality inherited from medieval and reformed Christianity. Much of that private morality has in the past century evaporated, so that the pursuit of individual self-interest in Milton Friedman's time no longer operates under the necessary moral restraints which Adam Smith took for granted.

If Hirsch is correct in his diagnosis of the ills of western society, the economic and social "sickness" of Britian, Italy and France does not arise primarily from inflation, poor corporate management, greedy trade unions, excessive or insufficient governmental intervention, but from structural overload and moral deterioration. It is these latter which throughout western society are threatening the realization of that dream of life, liberty and the pursuit of happiness for all which Thomas Jefferson evoked 200 years ago.

It may well be that the resolution of our problems will require a much more fundamental reorientation of social and economic doctrine and practice than can be achieved at a dozen summit meetings, necessary as these are. More modest goals, less extravagant technologies and more attention to traditional values are likely to prove as essential to the health of rich as of poor societies.

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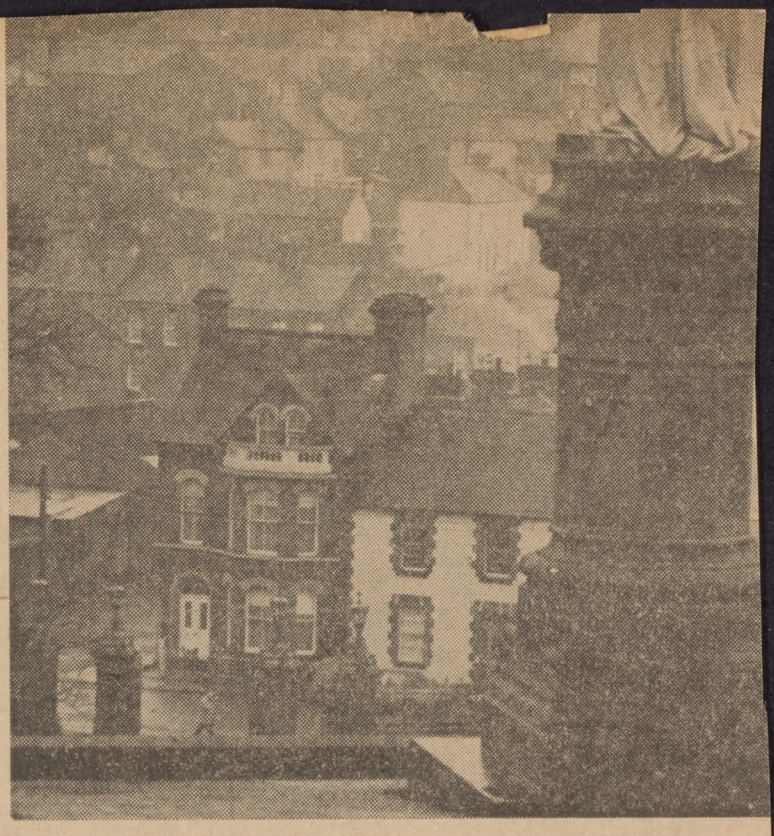

SEPARATE VANTAGE POINTS — The statue of a former primate atop the C St. Patrick's Cathedral faces across the Northern Ireland town of Armagh. Op square-towered on its hill (background), stands the Protestant Cathedral Patrick. Armagh, where St. Patrick made his headquarters, has been Ir ical capital since the 5th century. It has been hallowed ground and or both major Christian sects over the years. The two current prima close personal friends and they both condemn today's violence.

iwan Regularly Insists Ti
clear Facility Is Not Dev

By Melinda Liu
Washington Post Service

EI, Taiwan — Behind barbed wire
arded gates, teams of Western-
d scientists are quietly but
essly nudging Taiwan into the nu-
rena.

ous eyes in both the East and the
re watching the Institute of Nucle-
ergy Research, a sprawling con-
complex southwest of Taipei that
rs Taiwan's nuclear pursuits.

ablished in 1970, the government-
rted institute is a branch of Tai-
s Atomic Energy Council. Here the
nalist Chinese have assembled all
facilities needed to reprocess spent
ear fuel and produce plutonium that
be used to develop nuclear arms.

nsconced in the Taiwan institute is a
egawatt, Canadian-supplied research
tor closely resembling the reactor
was instrumental in India's 1974 de-
pment of its first nuclear device.

Repeat Their Vow

lthough they have the required para-
rnalia, the Nationalist Chinese period-
lly repeat their vow not to manufac-
e nuclear weapons, thus reminding the
rld that they can do so if they want to.
President Carter's Jan. 23 statement fa-

voring elimination of all nuclea
was followed by a statement of
from Taiwan Premier Chiang C
Chiang added that "although the
alist Chinese government has the
ity of developing nuclear arms
never engage in the production
weapons."

In 1975 the premier said his
would never develop nuclear wea
cause the prospct of unleasing
fury against "Chinese compatric
mainland" was unthinkable.

The Nationalist Chinese fa
pragmatic considerations. A su
ducted by the International Ins
Strategic Studies in London e
that the People's Republic of Ch
stockpile of 200 to 300 atom and
bombs. Said one Taiwanese
"What good is it if we have
when the aggressor has 100?"

No Delivery System

Another analyst said that alth
wan has the expertise to develo
ar device, the Nationalists hav
perfected an effective delivery
"At this point," he said, "if Taiw
piled plutonium or even detona
clear test device, it owuld be lik
with gunpowder without a gun.
can't throw gunpowder all the
Peking."

This last point may not remain
eration for long. Taiwan's Institu
clear Energy Research is conv

V. L. Kellogg
Carmel
Calif.

THE DESERTER FROM THE "BRUTUS".

by

Max Vernon.

of the "Brutus"

Do I Believe in Immortality?

A scientific man's belief about immortality may rest on either of two bases: on faith, or on what he calls "scientific proof." Many scientific men believe in immortality on a basis of faith; but almost none believes in it on a basis of scientific proof. A few, very few, I think, believe in it on the basis of the alleged proofs offered by the spiritists. But scientific men as a class do not believe in the existence of spirits. They do not accept them as scientifically proved, and few are inclined to accept them on faith.

Rigorously trained to accept as proved only such things and phenomena as can be tested by the special senses, assisted often by instruments of precision, and by carefully guarded induction from such observations, many scientific men hesitate to permit faith to carry them very far along the road of belief. And yet in the present absence of scientific evidence concerning some very important problems connected with human life and itspossible extension as something immortal many do rely on faith as a basis of believing something about these problems. But perhaps most scientific men take, with regard to these great problems, a position of honest agnosticism. We say that we do not know -- and we stop there.

Personally, I do not like to stop there. I want to believe in immortality, and I so strongly want to that perhaps I do. I am honestly confused about this. But if I do believe in immortality I do so on a basis of faith, not on a basis of scientific proof.

The really important thing I wish to say, however, is this: If it is true that scientific men have no scientific proof of immortality, it is equally true that they have no scientific proof that there can not be immortality.

There is an unfortunate tendency among some scientific men to be willing to declare that this or that as yet unproved or unobserved phenomenon can not be. This is equivalent to making the violent and wholly unwarranted assumption that we know the whole order of Nature. This is not true. In fact, we know only a very small part of the order of Nature. The whole history of science reveals the constant discovery of the reality of things which when first talked or guessed about seemed and were declared to be unreal and impossible. Scientists can be of dogmatic and as bigoted as preachers, teachers or politicians. Any scientific man who declares that there can be no immortality is such a bigot. He has no more scientific proof, perhaps less, on which to base this declaration than have the few who declare that immortality is scientifically proved.

Let no declaration of the impossibility of immortality by any scientific pundit have the slightest weight with you. Scientific men simply do not know whether there can be immortality or not. If you have such faith that you can believe in it, then believe it. Such a belief may have a great usefulness; and it may sometime be proved to be true.

Vernon Kellogg

National Research Council
Washington, D. C.

THROUGH THE DESERT BY ROWBOAT.

by

Vernon L. Kellogg.

Travelling by rowboat through the desert or getting extremely thirsty on the sea, have, at first hearing, the sound of absurdities. But both matters are easy to achieve. Many a man has gone mad of thirst with

> Water, water everywhere
> And not a drop to drink,

while not a few have rowed and floated their way through the heart of the great American desert. To this rather unusual type of desert traveller I belong by virtue of a Christmas fortnight's experience several years ago. It was an experience sought with an object. I wanted to know the desert better. I knew it already a little from the windows of trans-desert trains, but its strange rocks and plants and beasts, its chromatic mountains and sun-bathed mesas, had always beckoned me to a closer acquaintance. Finally the time came. The means were a great river, a little rowboat and a pleasant companion or two.

That the Colorado-Mojave desert, which is admittedly a real desert in which men have suffered real and horrible desert deaths, can be traversed by a rowboat, is a sort of physical geography joke. It comes about through an interesting con-

spiracy/

spiracy of high mountains, heavy snowfall and ardent sun in Colorado and Wyoming. These conspirators produce first two lively, cascade-running, canon-cutting mountain rivers called the Grand and the Green, which fuse somewhere in Utah to become a greater river that cuts still greater canons; even so great a one as that Grand One of Arizona. Then this big, violent river comes out and traverses, with less violence, and even some laziness, several hundred miles of real desert.

The Rio Colorado is the desert's river, but the desert doesn't make it. In the stretch of three hundred miles that we rowed over it receives only one desert-made tributary, a stream that drains an area larger than Massachusetts and whose mouth I jumped across with a short running start! The desert doesn't even want the river perhaps. But it can't help itself. It has to have it because of that friendly conspiracy of snow and sun in Wyoming and Clorado. But it takes a revenge on the river. When that river, whose breathless waters have just come from their proud earth sculpturing in the Grand Canon, reaches the desert, it drifts along wearily, alone, and silent. Its once clear waters are dyed red with sands it washes from its banks; its purity and wholesomeness are destroyed by the alkali that dissolves into it from the desert rocks and soil; its very banks no longer hold it together but its waters often divide and wander as separate channels and lagoons finding each other sooner or later only to part again. How changed

and/

and subdued is the great river! And finally after five hundred miles and more of weary sluggish wandering through the desert, only here and there relieved by the excitement of cutting a minor canon through the harsh desert mountains, and joined in all these miles by but three ever live tributaries, the great Silent River comes to the wastes of sand on which roll the blue salt waters of the Gulf of California.

It is on the tired waters of the Rio Colorado that one is able to make a journey through the heart ofthe Desert in a rowboat.

The water - hardly red, although sufficiently red -suggesting to warrant the use of the word in another language for the river's name - is so heavily laden with silt that a wineglassful is opaque. The banks, where the river winds on the desert floor, are simply two or three or four feet of crumbling soil; and dotted everywhere in the great breadth of the river are sand banks, some lifted, wet and shining, but a few inches above the water's surface, and bewilderingly changeable and evanescent; others higher and sparsely or even densely covered with low vegetation, true islands, and furnishing tolerable camping grounds when river-banks are too inhospitable. But the banks are not uniformly low. Through five groups or ranges of weird desert mountains the river cuts its way in its course from The Needles to Yuma, and in cutting through each range, makes for itself a true canyon with vertical rock walls from scores to hundreds of feet high, which merge into higher cliffs/

cliffs and pinnacles with scarred and broken faces, dyed with red and purple, green and ochre yellow. Between these sheer walls, with their impending minarets and turrets, the river is always narrow and swift. Here are the whirlpools and erratic currents; here it behoves the adventurous desert mariner to give over the assimilation of scenery and attend his helm. In Mojave Canyon, our first experience of the Colorado in a chasm, we came our nearest to wrecking - and wrecking there would mean finishing. To find the boat swinging broadside on to the leaping current and showing a curious fascination for a fierce little maelstrom engendered excitement quite to the thrilling mark. It was only a swift concert of work on the part of rowers and man at the long rudder oar that overcame the boat's tendency to independent exploration. And below the whirlpools and the quick dashes of the current toward jutting rocks were the rapids. But the running was only pleasurable excitement for there were no dangers we could see! How many rocks were just concealed we never knew; we found not one.

Even out of the canyons the river banks are not always low crumbling margins of sand. Often enough the alluvial bottom which margins the river on both sides, in varying width, is interrupted by intruding tongues of rock-strewn cactus-bearing mesa, that carry the true, parched desert floor to the very water's edge. Lava flows are sometimes cut/

cut through, and high, round-shouldered desert lomas thrust their bulk forward to the river brim.

But mostly the river outside of the canyons is bordered by alluvial bottom - in winter. In spring this bottom takes a turn at being river bed, for the Colorado annually over-flows its more usual banks, leaping from a stream that flows 10,000 cubic feet per second past a given point, to one carrying five times this mass of water. And these annual over-flows have, in long time, deposited fertile silt along the river margin to the extent of 500,000 acres of surface area. These are the acres which are to support the American Nile's littoral population. When the hydrographic engineers get worked out their problem of dispensing with discrimination and economy what Nature now bestows over this second bottom of the Colorado with lavish but, from man's point of view, too careless hand, the present jungle of arrow-weed will be supplanted by the ordered rows of extra-early tomatoes and yellowing, crooked-neck quashes.

Only less unapt than a great river in a desert is a jungle. But jungle is the true word for the dense tangle of arrow-weed, mesquite, desert poplar and willow that covers most of the margining alluvial bottom of the Colorado. On the day that we were stayed by a sand storm in our little hacked-out circle in this jungle, our chief diversion was in attempting to bore gimlet-wise through the dense arrow-weed and mesquite walls of/

of our prison. Here and there were low dark tunnels large enough for their makers, the coyotes, but difficult highways for a cousin who has learned to carry his head and forepaws proudly up. No cactus or creosote in this jungle; they are plants of the higher and dry mesa. Pale, gray-leaved, slender arrow-weed mostly, thorned mesquite for effective physical and moral support, and desert poplar and willow scattered through to give wonderful spots of rich colour and a welcome to the voyager in their likeness to better-known trees. This jungle shows what water can do for the desert sands; with only one real satisfying soaking a year these thousands of acres grow as lush a plant cover, although of very different sort, as one may see on the windward side of our Pacific Islands, with their yearly 200 inches of rain-fall. And this in the face of a burning, drying flood of sun-rays lasting for all the months between the spring inundations.

All day we crouched stifling and stinging in our jungle cell, while the world was overwhelmed with a great driving misty cloud of sand. No mountains nor sky; simply a dull yellow-brown vapour of desert wrapping everything in its corroding mantle. These are days when the desert sculptures its monuments; when it figures and writes with its mighty sand blast the hieroglyphs in its temples.

But what of the life of the desert! And there is life there, make no mistake. A kind of life that shows how adaptable, how/

how clever, animate Nature is in the face of inhospitable, even fiercely hostile, inanimate Nature. The plants of the dry sand or rock-strewn mesa floor show each its own keen shifts for a living; this barrel cactus has a ludicrous, unlovely form, but by its surrender of graceful branchery and dancing leaves, it changes its proportion of exposed water-losing surface to bulk to such good purpose that it presents but 1/600 part of surface for mass compared with the similar relation in an elm tree. Vegetable cisterns, these solid-bodied cactus creatures are. But how well guarded from roaming would-be drinkers by the fantastic exuberance of piercing and burning thorns; some straight as needles, some curved, some branched, but nearly all treacherously set so as to pull out and make their memory last long in the mind of the new acquaintance. All sorts and conditions of cactuses, but all made into strange and distorted beings by the demands of successful desert living. On the level stretches is the creosote with its scrawny, thin, uncertain branches and scarce little leaves well varnished with a malodorous sickly green resin. Not even a starving animal child of the desert can stomach that verdure. Where the creosote goes one may know the desert floor to be decently free from alkali, and to be loamy, that is, as loamy as desert soils may be. If one would be a desert farmer let him take abode where the creosote is neighbour. Then in the dry washes, there where the water

from/

from the rare cloud-burst runs swiftly off, are those delicate ghost trees of the desert, the palo verde, and the palo fierro, smoke bush and crucifixion thorn. There, too, will be the well-armed mesquite with its horse-food beans. The tornillo is a mesquite with curious tightly-wound, spiral or curled fruits or pods, which taste like a mixture of brown sugar and pea meal; rather like a generic breakfast food. I think there is an opening for some enterprising Battle creeker in Tornillo Food for Man and Beast. At any rate desert Indians and desert horses would come quickly to their end in some places were it not for tornillos. Finally, by the great river are the plants and trees which the newcomer to the desert will greet rapturously. Cotton-woods and willows; yes, and almost - not indeed exactly - but almost like those that grow on the old farm! If one would see the only truly autumnal foliage in California one must leave its paradises and go to the heart of its desert. The banks of the Rio Colorado at Christmastide show such dancing hosts of trim golden leaves as are to be found nowhere else in all the Golden State.

If the plants have to protect themselves not only against the inanimate desert things but also against those which would eat them or drink them, that argues the presence of animal life. One sees of little of desert animals, though. They are quiet, as befits both prey and preyers in a region where the struggle is severe. They are mostly of sombre colours

or/

or more truly of sand colours, as also befits them that would scamper or flit unnoticed, and finally, mostof them find that to stir about in the brilliant sun-glare of day, despite prudent silence and protective dress, is still too dangerous, and so they venture from their holes and hiding-places only under the kindly desert moon. As we lay in the strange, silent nights in our rough nests in the jungle, there came to our ears, besides the sudden splashes made by the constant falling in of the crumbling banks, many smaller sounds: little sniffs, timorous intermittent gnawings, a start, a rustle, occasionally a heart-chilling maniac cry or laugh from the coyote; and in the morning the smooth sand by the water's edge would be all marked over with the tracks of the night prowlers. Dainty little toe-prints of mice; the odd sign manual of the kangaroo rat, made by feet and tail together; the impress of the larger paws of fox. Empty as the daytime may be of animal life, the desert nights mustbe ~~fil~~ full of scurryings and leapings; feverish chasings and quick tragedies among/many small furry things. Rabbits, the small desert cotton-tail, and the great gaunt dun-coloured jack-rabbit, coyotes and foxes, gophers, so-called wood-rats and short-tailed chipmunks, bats that gather in mountain caves marking the old seashore, and most interesting of all, the long-and-strong-tailed kangaroo rats; these are the commonest of the desert mammals. And of these only the coyotes and chipmunks are to be/

be seen abroad in daylight. We startled, - or rather were startled by - a deer on one of our trapps back from the river up a dry wash. He seemed most out of place as he leaped swiftly up the black mesa-side and made off towards some distant barren mountains. In the sand floor, under the spreading creosote bushes are nest holes, small and large; and here and there tucked away amid the thorny arms of a many-branched cholla cactus are the strange masses of twigs and cactus tips which desert rats heap up for a nest. This rat and the brown-streaked cactus wren are the only creatures on companionable terms with the cholla. How they come to have immunity from those myriads of needle-sharp spines is simply mystery. The wren makes nest-like shelters in the very heart of the cholla "bush" where certainly no preying beast or bird can follow it.

Almost all the desert animals are faded gray and brown and yellowish white. The kangaroo rats, two sizes of them, have a beautiful yellowish-brown fur above, fading to yellowish-white below. The cylindrical, soft-haired tail, twice as long as the body, carries a ragged little tuft or pencil of longish hairs at the tip, and is regularly used to help in leaping. The cotton-tail rabbit has unusually lone hind-legs, making for swifter running, and ears longer and broader than its cousin's more familiar to us. Keen to hear and swift to flee: therein is the safety of the preyed-on in the desert. But look/

look to the preying fox! There also are the extra long hind-legs and extra large ears. Keen to hear and swift to pursue; in these are the reliance of the desert hunter. Impartial Nature deals delusive aid to the hare with one hand while she encourages the ogre fox with the other!

Of the feathered sort of animals there are more kinds, and these more in evidence than those of the furred sort. A bird-knowing friend of mine has recently published a list of nearly fifty species and varieties of birds noted by him in a nine-days stay at Palm Springs in the western arm of the Colorado Desert. But a tiny, silver everlive thread of water has been led by human artifice to this spot inthe desert, and on it have been strung five beads of ranches with orange trees and other bird-attracting and bird-supporting shrubbery. One will not find so many feathered kinds elsewhere inthe desert. But along the great river we saw birds enough to keep us in constant heartful company. On the river itself, and making its sandbars often noisy with life, were ducks and geese, and, finest of all, magnificent white pelicans. From a bar suddenly come upon around a sharp bend, thousands of these broad-pinioned creatures would rise, with the rushing sound of a great wind. They would seem at first, with their violent flappings and fierce-looking great pouched bills, as if about to overwhelm us. But always their wheelings and manoeuvres were dictated by a safer policy, and with ever higher shiftings and/

and circlings the immense flock would finally stretch out in orderly retreat. All through the river jungle, too, were hosts of the beautiful desert partridge, Gambel's quail, twittering conversationally to each other or sounding, at our approach, their clear five-syllabled alarm call. They have another shrill cackling sound which is uttered just as they take flight. In the mesquite groves, feeding chiefly on mistletoe berries, were excitable black and white phainopeplas, while in the golded-leaved cottonwoods groups of little Audobon warblers chirped and fluttered. The desert woodpeckers, the Gila and the gilded flicker, betrayed their occasional presence by harsh cries, while a few black pewees and blue-gray gnat-catchers were now and then glimpsed as they flitted about. Rather common was a jerking little desert tit, known as verdin, and occasionally we heard the rasping shriek of a swooping hawk.

Of fishes, the dense red river has almost none. One ugly pallid, flat-headed minnow, ten or twelve inches long, is caught by the Indians in rude fish-traps set along the river bank, but a dilute solution of alkali infiltrated with red sand is no favoured medium for finny life, and the Colorado's fish fauna is as meagre as the water's appearance would lead one to expect.

And so we voyaged through this land of silence and wonder. Days of rowing and floating, gazing and dreaming, punctuated by/

by incident; running a rapids or winding through a narrow, dark and craggy canyon, shooting the game for our dinner, struggling with the clinging sand of a treacherous bar. From the burning noonday sun we would seek cover ashore in a mesquite grove; in the cooling late afternoons we sat with widening eyes filled with the marvellous colour pictures made by the painted mountains; at evenings we huddled close around our little camp fires and later lay in our blankets chilled by the swift-coming cold of the desert night. Occasionally we would forsake the river for a day and tramp back into the bare vari-coloured mountains, scraping intimate acquaintance on the way with desert topography and flora and fauna. These mountains with their sierra crests, sharp and irregular, have their feet washed by wind-driven drifts of sand and often look, at a little distance, as if rising from a white sea. It is the desert's grim mimicry of the ancient ocean beating on the jutting promontories and towering cliffs of its volcanic islands. This long-gone ocean leaves its marks plainly enough in the old shore lines, succeeding each other, lower and lower, on the mountains' sides. The rocks of these mountain masses are as varied in kind and disposition as in colour. Granite, gneiss, porphyry, and trachytes, volcanic tufas and scoria, are the principal kinds. The marvellous colours of the mountain faces are mostly due to the pink, purple, white, blue, yellow and brown porphyries, often massed in close juxtaposition. The black/

black mesa surfaces are composed chiefly of scoria and tufa, thrown out by the ancient volcanoes. Mixed with them are chalcedonies and jaspers, and sometimes bits of silicified wood. The peaks owe their curious chimney-like forms to their composition of columnar trap. Some of these chimneys, towering vertically aloft hundreds of feet above the main mass of the mountain, make landmarks which can be seen for scores of miles across the desert floor. Along the river's edge are strata of clay and sand, and often beds of volcanic conglomerate, all deposited by water. Finally, metallic minerals in much variety are present. Iron ores, copper and the precious metals are scattered through most of the desert mountains. And one of the metals in particular accounts for the presence in these inhospitable stretches of another kind of life than the plant life and animal sorts already briefly mentioned. The allure of gold has worked its usual result and the desert has had its human life - and has some of it still - as well as its cactus and coyote inhabitants. In the Purple Hills and Chocolate Mountains, under the towering cliffs of Monument Peak and in the painted chasms of Riverside Mountain are the traces of the omnipresent prospector.

But before the prospector were the Indians. Mohaves, Chemehueyis and Yumas have lived from time out of mind in the jungles and arroyos that border the Great River. And not all are gone yet. Silhouetted against the sky we would see an occasional/

occasional figure, motionless and huge, keeping silent watch from a commanding loma summit; or again, a horse and rider would move along the bordering mesa parallel with us for an hour at a time. Once as we sat around our evening camp fire, we were startled at finding an addition to our party squatting silent,y by. As noiselessly as the moose bird comes to the hunter's fire in the Canadian forests, so our Indian visitor had slipped from the jungle and into our circle. And, as it turned out, for the same general purpose. He would help us to clean our pots and skillets and fill a hungering belly with our dinner scraps. Not a word but once; when asked if her were Mojave, he grunted with quick scorn, pointing at an amazing pair of leather soles tied to his feet, "No, me Chemehuevi; see shoes." A distinction that the sandal-wearing tribe makes much of. The occasional huts or cabins of the river Indians are curious examples of cloisonne construction. Long thin branches of arrow-weed and willow are interlaced up and down and across, and the little open square filled in with adobe. The roof is thatched with various weeds.

In the Sixties the Colorado desert had its first "boom". Its second is beginning now. On the old trail from Prescott across the desert to San Berdoo, gold was found, and in a twinkling the city of La Paz sprang into being at the intersection of trail and river. How many millions of gold were taken out of the dry gulches of the desert mountains in those days/

days no one knows. A relict of that halcyon time told us $60,000,000 were taken from the placer mines near La Paz. Then, strangely, the gold and the river both deserted La Paz. This desert Pompeii, with its crumbling adobes, its little burying-ground with stone-heaped graves - remember the desecrating coyote! - and its utter desertion, is now several miles distant from the flowing river which made excuse, in a new-found straighter channel, for deserting the doomed town.

Set like a fort on the mesa of the Arizona side of the river, a hundred miles north of Yuma, is an old falling adobe house which in early years was famous. Along the river's edge a stage road wound its interminable way through choking sand or over blackened volcanic debris. Set here and there on its weary length were adobe stations: insignificant punctuation marks in a monotonous story of heat and desolation. As we poked about in the old fort-like adobe ruin, a great hole or pit dug out in the earthen floor in front of the fireplace stirred out curiosity. Later we learned the tradition of gold accumulated swiftly by the keen road-house keeper, buried in front of the fireplace, whispered about, and finally and inevitably in such a land at such a time, bringing its red result of murder and robbery.

Here and there persists a derelict, a hermit, nameless, and wholly lost to the world of other men, finishing his life of beast or idiot in some crumbling cabin. One such being we/

we stumbled on with eyes drawn together by much blinking in the desert glare, and whose unused voice issued loud and raucous from his throat. Another staring, unkempt man, with wits not yet all gone, was engaged in the extraordinary attempt to "make a stake" by raising a crop of tomatoes in mid-winter in a tiny cleared-out spot in the jungle. All alone this man was battling with swift and persistent jungle that beat constantly at the edges of his acre to overwhelm it and him, while he nursed, with curious pathetic tenderness a straggling patch of tomato-vines, which two or three frosts had blackened and cut down almost to the roots. If he could get but just one crop of mid-winter tomatoes, he said, he could load his big rowboat with them and paddle and drift down to Yuma, and there turn them over into what would grub-stake him again for long months of renewed wandering and prospecting in the desert mountains.

But the human occupation of the desert, with its hopes and its bitter disappointments, its stories of incredible suffering, its tragedies, its uncovering of all that is best left covered in the human make-up, is a story by itself. Its records are scattered and they require a new sort of paleography for their reading. But some day the right man will gather them together, read them aloud and thrill us all.

At sunset one day we sat on the ragged crest of a low peak, a few thousand feet from the river, and looked out across the wilderness/

wilderness of glowing sand and purple hills. Far to the south rose the symmetrical summit of San Pedro Martir, the highest mountain in Mexican California, the unexplored peninsula. One hundred and fifty miles our eyes were carrying us in this transparent desert atmosphere. Only half as far away, but invisible, because of our own low altitude, was the broad delta of the Colorado, on the Gulf shore. And suddenly, under our feet almost, only a score of miles distant, sprang into sight a strange, little, slowly moving line of lights, points of fire that twinkled and vanished and shone again, but always creeping on - the Transcontinental Limited speeding across the desert with its brave company of hardy explorers forking oysters off the cracked ice. A ventriloqual coyote howled mournfully, as would say "And this in my desert." Yes, coyote, and there will come more and more glowworms wriggling across your desert's leagues of sand and mesa. And soon you will have to see your Silent River running no more without let or hindrance through its arrow-weed jungles. These little ditches that bleed the mother current, those curious new plants in straight rows, those white-faced creatures that push and pull - but indeed, why worry you with such gloomy forebodings, for your desert, your river, and your arrow-weed jungle. For when these come true, you will have passed, too. There were once the Great Plains and the Buffalo. And the time comes apace when it will be said "Here were once the Great Desert and the Coyote!"

V.L. Kellogg
Carmel
Monterey Co
Calif.

THE GULLS OF POLPERRO.

By

Vernon L. Kellogg.

It was on the rough Cornwall coast just inside the lonely, winking eye of Eddystone, and in the region of the Looe Diehards and those Fowey Freetraders who led the English coast guard a merry chase for so many years.

If you start from Looe, as we did, going westward along the coast, you come first to Talland church with its curious carved pews and foliated pulpit and other wealth of antiquary's treasure all too little known. Then after jogging on for half an hour in your curious vis-a-vis cart behind the shaggy, coughing little pony you plunge down into the head of a winding ravine, past an old mill that is more a picture than any one ever hung on the Water Color Society's walls, and lo, of a sudden you are at the sea and in Polperro.

And you cower a moment in terror if you are unused to the fishing villages of the Devon and Cornwall Coast, for you are on the moment charged by great, strong-pinioned, fierce-beaked, flapping, barking, crying things of air. They swoop down at you from the vantage of the house roofs. They soar over you with motionless wings, turning and wheeling and twisting their heads to stare you into fright. They call in hoarse cries to each/

each other about you. The gulls of Polperro!

How can words picture the lines, the color tones and sombre bizarrerie of Polperro in the ravine's mouth by the Cornwall sea? Crowding and jostling, standing on each other's heads and shoulders, the craggy gray stone houses clamber up each precipitous side of the cañon-like ravine. And on above them stretch the softer but swiftly rising higher hill slopes, broken by the lines of fields or the sinuous curves of well-worn footpaths. In the bottom of the ravine runs a sluggish streamlet crossed by frequent lichen-covered, single-arched, stone bridges. This stream widens as the ravine widens and near its mouth becomes a broad shallow estuary of the sea, in which the tides run strongly back and forth. On its waters at flood, or its reeking mud banks at ebb, a score of single-masted, blunt-ended, round-bottomed fishing luggers rest through the day. Between midnight and early forenoon these boats are all out on the banks garnering their uncertain harvest. Fog or clear, storm or peaceful water, this daily searching of the deeps goes on. Shining mackerel and bream, hideous flapping flounders and sting-rays and thick-bodied, slimy conger eels all are good grain to the Polperro gleaners. Only on Sundays is the life of lifting the deep lines, hauling the seines, gutting and weighing and boxing the fish interrupted. And then the whole Polperro worships with one hoarse, uplifted/

uplifted voice its God of storm and calm, of good harvest and bad, its Almighty Master under whose fear and favor boatman, wife, widow and orphan live as unrebelling fatalist.

For it is assuredly no care-free life, that of a Cornwall fishing village. It is playing one long uncertain game with a cold and pitiless sea that takes its toll without a moment's warning or a second's consideration of the heart of wife or the empty mouths of children. For years maybe the gleaner has come and gone, and the harvest has been constant, the flowers have blossomed for him unfailingly in the tiny garden plot by the doorstep of his gray stone house. And then the sea takes its toll for its long complaisance and there is abiding sorrow and want in that house. On its weathering slates the gulls will sit and cry as of old, but with a new voice and terrible to the bent wife and the cowering children underneath. They call hoarsely for the gone fisherman who comes no more to provide them with the fat entrails of countless fishes at the forenoon cleaning hour on the foul and slippery stone wharf by the water's edge. They howl down the cold chimney like menacing spirits of evil and then rise and flap heavily or sail easily back and forth and around and over the village that is their dominion. The children come and the old men go, but they seem immortal, these gulls of Polperro. The same great birds perching always on the same stone chimneys/

neys and stalking over the same everlasting slate roofs, or drifting on their broad pinions in and out to sea with the enduring monotony of the tides.

I had climbed slowly up the slippery path— it was always wetted by the quick showers or drifting sea fog— to the summit of the headland that guarded one side of the little harbor and overlooked a long, long stretch of restless water. Here and there sat or stood the scouts of the mackerel crews— mostly old men, weatherworn and gray, too feeble or slow now for the strenuous and quick work of racing the heavy boats or 'shooting' the long nets. These watchers peer ever out over the sea, and when they mark the momentary dark shimmer on its surface as the moving shoal breaks water, they shout and wave a cap or coat to the men lounging on the boats in the harbor below.

I sat down by the side of the nearest scout, an old man bent and lined and thin-haired, and with a curious face, half shrewd intelligence, half childish senility. He was watchful enough of the sea, but he kept throwing out of a small basket on to the grass occasional shining little dead fishes which were snatched up by a few gulls that hovered about him. We talked of the sea, the fisherman's life, the ways of the fishes, the storms and danger. His talking was intelligent, with flashes of dry humor, and his lore of weather and water and fishes/

fishes and fishermen all came from the experience of long years. He interrupted an account of the care of the nets, their boiling in pitch, their repairing after a shark's ravages, to point at an old woman who had come slowly along the crest of the headland with her face ever to the sea and occasionally stumbling sadly in consequence.

"She 'um a bit gone," he said touching a finger to his forehead as he spoke. "Man and boy it was, both together she 'um lost, a month by. They found the boat upside wi' never a signs of Jock and the boy. She seems to think they 'um out there swimmin' around perhaps. And so she watches. For they 'um promised, down there in the harbor, to go when she waves."

And just then an eager swift look came into his face. He paid no more attention to me, no more to the stumbling haggard woman slowly passing us, unnoticing. His eyes were following fixedly a great slaty-backed gull that was coming in easy sliding flight along the cliff's edge. It came nearer and nearer and always he watched it more intently. Suddenly he cast a whole handful of the little dead fishes from his basket into the air, and the great bird swooped down, catching one before it fell, and then settling awkwardly with its long white-tipped wings held half flapping, half folding, over its back while/

while it snatched up three or four more.

I stared in wonder at the old man; at the bird. The man's eyes shone; his face was lighted with a pathetic eagerness. He seemed to want to hold the bird by us; he threw constantly handfuls of fishes toward it. But it soon rose and flapped slowly away on along the crest line toward the harbor. The old man sank back from his strained posture and catching my eye, mumbled, as in sort of explanation, "One of Martin's gull's."

"Martin's gulls," I echoed, inquiringly.

"Yes, them that brought us to ~~him~~ 'ee, you know."

But I did not know and said so and asked to be told. So with a last lingering glance after the distant bird he began to tell me quietly and without feeling or excitement the story.

"I know 'ee by the patch of brown in his back where there should be none by rights. Some of the others I know too, by a missing wing feather or a nicked bill or a manner of flight. But, of course, some I don't know, and so I feed all that comes.

"Martin was ever a feelin' lad. He loved the people, the boats, the gulls. As he cleaned his catch on the wharf or in his boat in the harbor the gulls came most to 'ee. For he threw them all the gutties and the too little fishes, not too fast that some sank, nor too slow that there was waitin' whilst the other birds was gettin' to feed near by. The gulls knew/

knew Martin for a feelin' lad, and — yes, and so did Ilma. Ilma Curtis was Martin's sweetheart sure enough, but she 'um the tantalizin' way. And not strange when she 'um the prettiest lass in the town, aye, or in Fowey or Looe or twenty miles more of Cornwall coast, and all the lads was but too willin'. Not strange then that she 'um the tantalizin' way. And some foolish ones mistook this way for chance. They 'um no chance, I tell 'ee, wi' Martin. Martin loved Ilma; she loved 'ee.

"But Haldane Pengelly — may Beelzebub's imps never let 'ee from their red-hot forks — had the black pride along wi' his black soul. And he 'um mad wi' love or desire of Ilma, and hung on when all the others dropped off. For finally the banns was said, and it is flyin' in the face o' the Lord above to interfere 'tween man and maid after then.

"But Pengelly's was a lost soul. Lost wi' the lust of hate an' the lust of desire, and every mornin', at cleanin' time when Ilma wi' the other maids and wives would be jokin' and laughin' wi' the men and helpin' clean and count the catch, Pengelly would sit silent at his work, but watchin', watchin' an' burnin'. And wi' every pretty word and flashin'smile 'tween Martin and Ilma he would shoot fire from his green eyes and close his hand tighter on his cleanin' knife.

"Once he was so intent on watchin' and listenin' to what was his daily cross and scourge of whips — wi' the Blessed Master's/

Master's pardon — that he cut hisself deep, and the blood flowed, a red black stream. But he never noticed it.

"And the other maids put out by this neglect of 'em by Pengelly — for he 'um a way wi' 'ee, an' a good boat, and was a venturesome sailor takin' chances and often comin' in just in the nick o' time, but wi' a cubby full where the rest of us was empty — the other maids didn' keep their tongues on a leash. For they were spited, and took it out in remarks and jokes over the cleanin' wi' waspies' tails to 'em. And for sayin' things that sound fair but carry ranklin' barbs there's no better, or worse, than the Cornwall maids.

"Well, the week of the great storm came. You 'um heard of it, perhaps. No worse in memory of man on this coast. Such a wind, and cross winds, and cold, killin' cold, and sleetin' rain that knocked ye and cut ye and with it all, fog, the fog that blinds and muffles and dazes ye. You turn roun' once in the boat and you 'um lost in the world of gray mist and splashin' water. But you fights. You fights for your life — and for the life of the wife and kiddies. And some way you gets back, or most of ye does. This storm I'm rememberin' caught 'em all well outside. There was little sign it was comin', and usually we knows. But this time it was first the fog come on swiftly, and then, stealin' up under cover of it, the legions o' Satan on the water. And then it was every man for the harbor and the big sea-gate/

sea-gate and the imps o' hell after the hin'most.

"Well, we was all in, thank God, we thought. Some hurt wi' the cold and the struggle. Tom Maynard wi' the left arm broke but hardly knowin' it except he couldn' pull oar so strongly. And Henry Milton wi' two fingers danglin' by the cords from an ugly pinch o' the cubby hatch. And like that. But alive, which was only a wonder and a favor from the Lord above. And then of a sudden came a great cry for Martin. It was voice from a woman and yet no woman's voice. So low in the throat, so rasped by the clenchin' teeth. My God, it was so! Martin was not in. Martin alone, the quickest and strongest and surest of all the town, was not back. And we knew, and she knew, that if he was not back now he was not comin' back.

"She called no more, just the once. Them of Polperro will never get that great cry from out their ears. All of love and of misery — and of defiance, sometimes I think, to Him who disposes — that can be uttered in voice o' human. And perhaps there was in it too — some seemed to think so — scorn of them that had come in leavin' Martin outside. But what can one man do for another in such a time? The women know much of the life of us, but of just how it is out on the cold gray banks only us men what goes there knows. And when the storm comes, and worse, the fog wi' the storm, then no man can do more for another than/

than call perhaps to him to gi' 'ee cheer, or pick 'ee gaspin' from the water if so be his boat goes over close by and the wash brings 'ee along side.

"But on that cry we fell to questionin'. Who had seen or heard Martin the last? And no one spoke up, till Henry Hilton, 'ee wi' the bleedin', danglin' fingers, said he heard Pengelly callin', 'Here, Martin, this way,' and then the wind and wave shut out all further hearin'.

"Wi' this we all turned to Pengelly, workin' silent in his boat puttin' to rights. He paid no attention for the minute, and then liftin' up slow, wi' a scowl he says:

"'I never seen nor heard 'ee.'

"And wi' that set to work again. We all knew, o' course, how Pengelly hated Martin, and perhaps he was not sorry that Martin was not come back. And we didn't want much word wi' a man as might be feelin' so.

"There was for the moment, aye for ten hours, nothing that mortal man could do. It was foolish death to go out the sea-gate in that hell smother o' spume and roar with any round-bottom fishing lugger. So we waited and watched for our first chance. And whilst we waited we worked on the boats. And then an ugly word went round. Ol' Harve Curtis it was that started it. And he looked to have reason. His boat was jammed up alongside/

alongside Pengelly's in the harbor there where we was workin' settin' things to rights. And as he straightened up once and happened to look into Pengelly's boat his eye fell on Pengelly's gaff lying along just under the gunnel. And his keen eye noticed its heavy, hooked, iron head stained fresh red wi' blood. And there was no fish scales on it!

"Well, that liked to have hung Pengelly right there. We questioned him sharply, I can till 'ee, and then we set four to stay and watch 'ee while the rest of us hurried out to hunt for Martin, for the water had gone down a bit. An' it was possible, tho', except for Martin's being out there somewhere, it was still no time for leavin' harbor.

"The worst was, the fog was still down, thicker'n ever, makin' you blind and deaf and dazed-like. But without the howlin' of the wind and the singin' of the sleet we could feel aroun' in the gray dark, and by very loud shoutin' keep each other's whereabouts a bit.

"It was ol' Harve Curtis who first heard 'em, the gulls barking mournful off in the fog somewhere. Do you know how hard it is to locate a soun' in a fog; especially a muffled and irregular soun'; one that comes when you are not expectin' it and doesn't come when you are? But old Harve Curtis's ears are keen as his eyes and he heard 'em and run 'em down. What's more/

more he knew 'em for what they were.

"'Martin's gulls,' he says to his boat-tender. And gulped a big half sob, half oath. 'God, he's wi' 'em,' says he.

"And they put out for 'em. Feelin' around, now hearin' 'em fainter, now louder. But ever gettin' towards 'em. And finally they was to 'em. Wheelin' around and around over Martin's boat awash there in the gray sea. And as Curtis come alongside he see Martin in a huddle in the bottom wi' his white face, wi' a ugly line of red down one side, peering wide-eyed but unseein' up into the wet sky.

"And then Curtis and the boat-tender gi' a great callin', and one by one we heard and came. And we took Martin home and brought in the boat. Martin wi' the blood still oozin', oozin', from the hole in his head where the gaff had struck 'ee. An' we went back wi' no words but every man wi' one idee.

"But when we was come to the sea-gate and safe inside there was the police constable from Looe wi' a mate and they had Pengelly in charge already. Somebody had spread the word. And that's all that saved Pengelly from renderin' an eye for an eye and tooth for a tooth in Polperro that awful day.

"Perhaps it would have been easier for him, too. For he was a long time in Dartymoor gaol afore he went out at rise o' sun one mornin' wi' the hangman. And they say death is much the easier to life in Dartymoor gaol. But he never came back; that/

that is, his black soul, to gaol wi' the hangman. An' his body wi' the broken neck and the tongue stickin' out and the eye-balls like 'orrid marbles went into the murderer's groun' inside the gaol.

"An' Ilma, you ask about? Why she lives wi' me now the old wife's gone. For Martin's sake, you know. And she it is that gives me each day the little dead fishes to feed the gulls wi'; the gulls that took us to my boy Martin there wi' his face white and red-sploshed in the washin' boat in the gray sea where Pengelly struck 'ee down for love and hate. Ah, love an' hate; hate an' love; what a work for Satan can them two do!"

#

V. L. Teeple
Carmel
Calif.

THE GULLS OF POLPERRO

I had climbed slowly up the slippery path -- it was always wetted by the quick showers or drifting sea-fog -- to the summit of the headland that guarded one side of the little fishing harbor of Polperro on the Cornwall coast, and overlooked a long, long stretch of restless water. Looking back over the gray village I saw and heard its innumerable hoarse gulls that perched and stalked on the weathering slates of the roofs, or flapped and sailed about over the houses in restless, wheeling groups. In the shallow estuary a score of blunt-ended, single-masted luggers tossed idly, and under the cliffs of the headland, on the ocean side, rested half a dozen row boats each with several men lolling on the rough seats. Here and there on the headland itself sat or stood the scouts of the mackerel crews -- mostly old men, weatherworn and gray, too feeble or slow now for the strenuous and quick work of racing the heavy boats or 'shooting' the long nets. T These watchers peered ever out over the sea, and when they marked the momentary dark shimmer on its surface as the moving shoal broke water, they shouted and waved a cap or coat to the men lounging on the luggers in the harbor below.

I sat down by the side of the nearest scout, an old man bent and lined and thin-haired, and with a curious face, half shrewd intelligence, half childish senility. He was watchful enough of the sea but he kept throwing out of a small basket on to the grass occasional shining little dead fishes which were snatched up by a few gulls that hovered about him. We talked of the sea, the fisherman's life, the ways of the fishes, the storms and danger.

His talking was intelligent, with flashes of dry humor, and his lore of weather and water and fishes and fishermen all came from the experience of long years. He interrupted an account of the care of the nets, their boiling in pitch, their repairing after a shark's ravages, to point at an old woman who had come slowly along the crest of the headland with her face ~~over~~ always to the sea and occasionally stumbling sadly in consequence.

"She'um a bit gone", he said, touching a finger to his forehead as he spoke. "Man and boy it was, both together she'um lost, a month by. They found the boat upside wi' never a sign of Jock and the boy. She seems to think they'um out there swimmin' around perhaps. And so she watches. For they'um promised, down there in the harbor, to go when she waves."

And just then an eager swift look came into his face. He paid no more attention to me, no more to the stumbling haggard woman slowly passing us, unnoticing. His eyes were following fixedly a great slaty-backed gull that was coming in easy sliding flight along the cliff's edge. It came nearer and nearer and always he watched it more intently. Suddenly he cast a whole handful of the little dead fishes from his basket into the air, and the great bird swooped down, catching one before it fell, and then settling awkwardly with its long white-tipped wings held half flapping, half folding, over its back while it snatched up three or four more.

I stared in wonder at the old man; at the bird. The man's eyes shone; his face was lighted with a pathetic eagerness; he seemed to want to hold the bird by us; he threw constantly handfuls of fishes toward it. But it soon rose and flapped slowly

away and along the crest line toward the harbor. The old man sank back from his strained posture and catching my eye, mumbled, as in sort of explanation, "One of Martin's gulls."

"Martin's gulls?" I echoed, inquiringly.

"Yes, them that brought us to him, you know".

But I did not know and said so and asked to be told. So with a last lingering glance after the distant bird he began to tell me quietly and without feeling or excitement the story.

"I know 'ee by the patch of brown in his back where there should be none by rights. Some of the others I know too, by a missin' wing feather or a nicked bill or a manner of flight. But of course some I don't know and so I feed all that comes.

"Martin was ever a feelin' lad. He loved the people, the boats, the gulls. As he cleaned his catch on the wharf or in his boat in the harbor the gulls came most to 'ee. For he threw them all the gutties and the too little fishes, not too fast that some sank, nor too slow that they was waitin' whilst the other birds was gettin' to feed near by. The birds knew Martin for a feelin' lad, and -- yes, and so did Ilma. Ilma Curtis was Martin's sweetheart sure enough, but she'um the tantalizin' way. And not strange when she 'um the prettiest lass in the town, aye, or in Fower or Lloe or twenty miles of Cornwall coast, and all the lads was but too willin'. Not strange then that she'um the tantalizin' way. And some foolish ones mistook this way for chance. They'um no chance, I tell 'ee wi' Martin. Martin loved Ilma; she loved 'ee.

"But Haldane Pengelly -- may Beelzebub's imps never let 'ee from their red-hot forks -- had the black pride along wi' his black soul. And he'um mad wi' love or desire of Ilma, and hung on when

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DR. VERNON LYMAN KELLOGG

CHRONOLOGY

1867. Born December 1, 1867, Emporia, Kansas, son of Lyman Beecher and Abigail (Homer) Kellogg.
1889. Graduated, B.S., University of Kansas.
1890-93. Assistant Professor of Entomology, University of Kansas.
1891-93. Cornell.
1892. M.S., University of Kansas.
1893. University of Leipzig.
1893-94. Associate Professor of Entomology, University of Kansas.
1894-95. Assistant Professor of Entomology, Stanford University.
1895-96. Associate Professor of Entomology, Stanford University.
1896-1920. Professor of Entomology, and of Entomology and Bionomics, Stanford University.
1897. University of Leipzig.
1904. University of Paris.
1908. At Florence, Italy, married Charlotte Hoffman of Berkeley, California.
1908. University of Paris.
1910. His daughter, Jean Kellogg, born in Berkeley, California.
1915-16. Director, Brussels, American Commission for Relief in Belgium.
1917-19. Assistant to U.S. Food Administrator.
1918. Chairman, Division of Agriculture, National Research Council.
1918-21. Chief of Mission to Poland, special investigator in Russia, member, American Relief Administration.
1920-31. Director and member, Executive Committee, C.R.B. Educational Foundation.
1922-32. Member Executive Committee, the Rockefeller Foundation.
1919-31. Permanent Secretary of the National Research Council.
1919-29. Chairman of Division of Educational Relations, N.R.C.
1919-34. Member of Research Information Service, N.R.C.
1919-34. Member, Division of States Relations, N.R.C.
1919-33. Member, Division of Foreign Relations, N.R.C.; Vice-chairman, 1921-33.
1921-33. Board of Trustees, Science Service.
1924-27. Trustee, The Institute of Economics.
1925-27. Trustee, The Institute for Government Research.

1925-31. Member of Executive Committee of International Research Council.

1927-36. Trustee, The Brookings Institution.

1931. Secretary Emeritus, National Research Council.

1937. Died, August 8, at Hartford, Connecticut.

MEMBERSHIP IN SOCIETIES, HONORS, AND DEGREES

Member: National Academy of Sciences; American Society of Naturalists; American Entomological Society; American Association for the Advancement of Science; Ecological Society; Association of Economic Entomologists; Genetics Association; American Philosophical Society; Washington Academy; Kansas Academy; California Academy; Academy of Natural Sciences, Philadelphia; Entomologische Gesellschaft; Société Entomologique de France; Phi Beta Kappa; Sigma Xi.

M.S. Kansas, 1892; LL.D. University of California, 1919, Brown, 1920; Sc.D. Oberlin, 1922; LL.D., Gallaudet.

Officer of the Legion of Honor (France); Commander of the Crown (Belgium); Commander of the Order of Leopold I (Belgium); Commander of the Order of Polonia Restituta (Poland); Gold medal (Poland).

Trustee of: The Rockefeller Foundation; The Brookings Institution; Gallaudet College; C.R.B. Educational Foundation, Inc.; Science Service.

Clubs: Bohemian (San Francisco); Cosmos (Washington); Century (New York).

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The extensive series of publications by Kellogg is impossible to list in its entirety in the limited space here available. Therefore only books and the more important scientific articles will be mentioned by name, while the total numbers of other classes of writings will be given. The range of subjects treated is most astonishing and rarely, even in hastily written articles, is there any lapse in style or scientific accuracy. When it is remembered that this extensive series of writings is but the by-product of a life full of teaching and administration, its extent and character are almost unbelievable.

In addition to the list of scientific papers, books and articles in books, here appended, there appeared book reviews to the number of 37 from 1920 to 1924; magazine articles to the number of 102 from 1916 to 1926; and newspaper articles syndicated, in many papers, to the number of 52 during the years 1920 to 1927.

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C. E. MCCLUNG
Philadelphia

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by

VERNON KELLOGG

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